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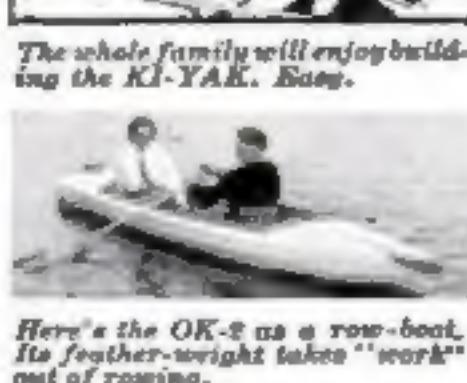
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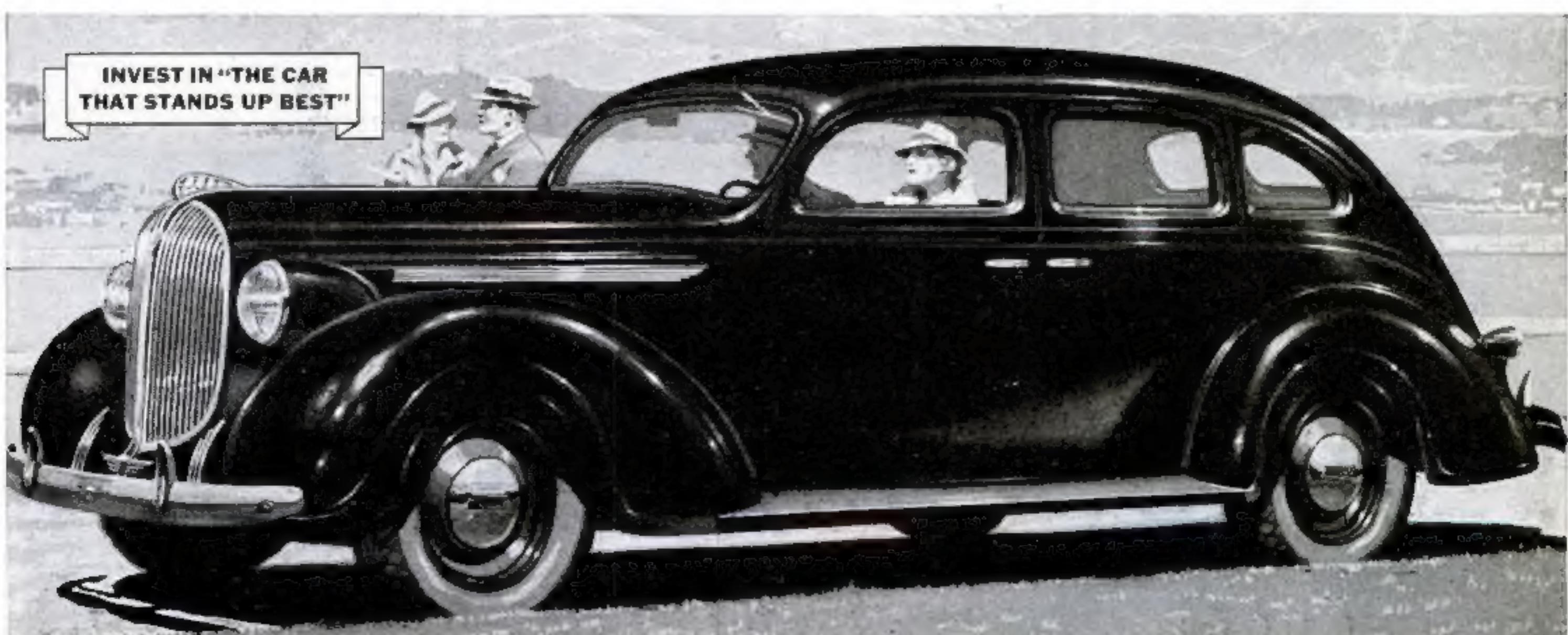
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# POPULAR SCIENCE

Monthly

Volume 132

Number 2

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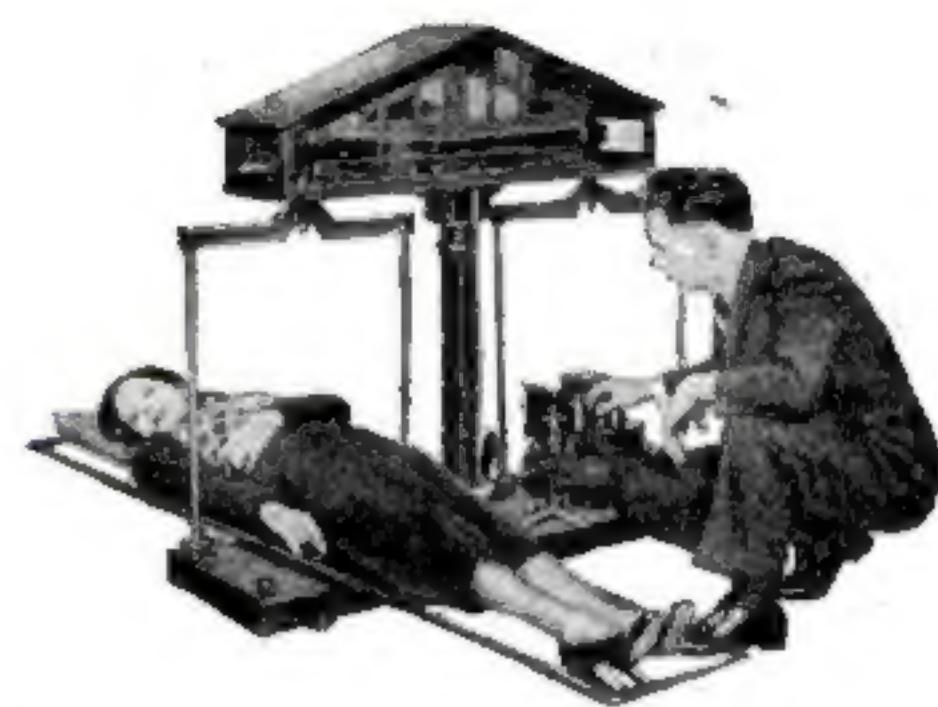
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# Our Readers Say



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IN ANSWER to H.S.S., of Timmins, Ontario, who was unable to convince a woman against her will that at the north pole there is only one direction along the earth's surface—south: he is right. Since the Equator lies the same distance from the pole at all its points, that is, south of it, all movements from the north pole along the earth's surface must take a southward direction. East and west can only be the directions of movements of persons or things along the earth's surface in a course parallel to the equator.—G.E.L., New York City.



## A Simpler Way to Waken the Furnace Fire

THAT alarm-clock device for opening furnace drafts, described in the December issue, is very fancy, but it sounds a little complicated. Here's what I did. I hung an ancient but dependable alarm clock by the ring on its bell from a hook screwed in the ceiling, right over the end of the furnace balance bar. I tied a small S-shaped wire on one end of a string, the other end of which was tied to the bar. Next, I adjusted the string's length so that when the hook was placed over the alarm wind, the draft was shut off. I set the clock at night for the time I want the furnace to begin its day's work. When the alarm goes off, the winder turns and dislodges the S-shaped hook. Gravity does the rest. It's simple, but it works. The balance bars on some furnaces may call for minor changes in the design I worked out for mine, but a little experimenting, mixed with common sense, will put the device in working order.—R.O.H., Springfield, Ill.

## Hair Is Better on Heads Than in Car Tires

THE suggestion of J.H.V., Farmingdale, N. Y., that human hair be used in the manufacture of rubber tires for automobiles, strikes me as being impractical. I believe the hair would tend to make the rubber brittle, if used in the quantities necessary to produce a twenty-five-percent increase in durability. A better idea would be to use pulverized scrap leather, mixed with rubber in the form of a chain or lattice-work that would be molded into the tire tread during the vulcanizing process. But don't forget the added cost of production, and the resulting increase in price. Tires are high enough now!—W.J.Z., New York City.

I CAN REMEMBER A STEEL-STUDDED LEATHER TIRE!



## He'd Electrocute Germs in Drinking Water

READING your article on the construction of an electric exterminator for insects set me wondering why it isn't possible to use some form of electricity to kill the germs in drinking water and swimming pools, thus dispensing with the use of chlorine and other distasteful chemicals now in general use.—A.DeG., New York City.

## 'Is This the Last Word in Long Words'

IN "The Man with the Net" in the December issue you tell about pneumonoultramicroscopicsilicovolcaniosia, as being probably the longest word in the English language. Here is a longer one that I believe comes under the classification. It appears on page 161, volume 7, of the 1918 year book of the American Pharmaceutical Association. It is pyrocatechinmonoacetodimethylamidophenyldimethylpyrazolon. Who knows what it means? —L.H.S., Herrick, S. Dak.

## Nudist Is Embarrassed by Lack of Pockets

YOUR item about the cigarette holder for nudists reminded me of a friend of mine who joined the in-the-altogether cult a couple of years ago. He spent his week-ends giving the mosquitoes a break at a nudist camp, but was greatly embarrassed (if such a thing is possible for a nudist) by the lack of pockets. No mere cigarette holder would have done him any good, for he was a pipe smoker and insisted on having on his person a large supply of tobacco, spare pipes, pipe cleaners, and matches. It was impossible for him to carry around all his accessories with his bare hands. He finally got around the difficulty by getting himself one of these short aprons that carpenters use, with the front full of pockets.—J. F., Washington, D. C.

## It Helps To Know What You're Reading About

AFTER studying the article "Do You Know How to Read?" in a recent issue, I felt that a very essential point in the matter had not been considered. In reading, the most important mental process is the comprehension of the collective meaning of the words. There is a definite pause, after each sentence, to allow the mind to grasp the matter conveyed. A reader may remember each word, yet be unable to comprehend their collective meaning, and so may be compelled to reread the sentence, at least in part. This is particularly true of long sentences dealing with obscure subjects.

There is necessarily a reasoning and consolidating process, even after the words are mentally recorded. After all, the purpose of reading is to comprehend what is written, not to get through in a hurry.—W.C.C., Delaware, Ohio.

## A Clash of Opinions on Frictionless Cars

IF FRICTION could be completely eliminated, as suggested by H.J.W., New York, N. Y., in a recent issue, I contend that a car could not move itself at all, despite H.J.W.'s argument that molecular adhesion between tires and pavement would be sufficient to cause some movement. This force would act in a vertical direction to the movement of the car, and therefore would not affect the movement in a horizontal plane. Only by interlocking molecules or by friction could movement be imparted from the turning wheels, unless we used a cog highway and wheels with gear teeth. This would still have its problems, as a friction-type clutch would not function and neither would brakes. I am personally content to wrestle with friction as mother nature intended. Here's to closer hair splitting.—C.W.R., Maryville, Mo.



## A Sound Explanation for 'Phone-Pole Buzz'

IN ANSWER to J.G.L.'s question from Hangchow, China: It is a common fallacy that the humming of telephone wires is caused by electricity flowing through them. The real cause is merely vibrations set up in the wires by the wind. The sound is naturally intensified when you put your ear to the pole, because of sound conduction through the pole from the wires.—W.R.K., Albert Lea, Minn.

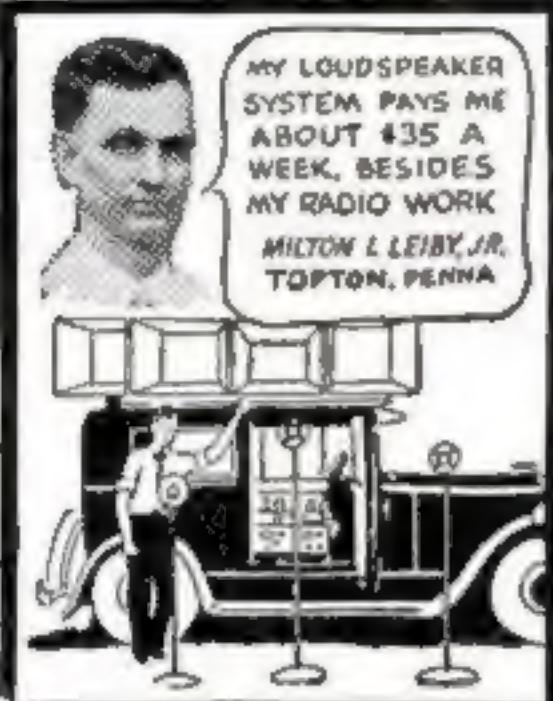
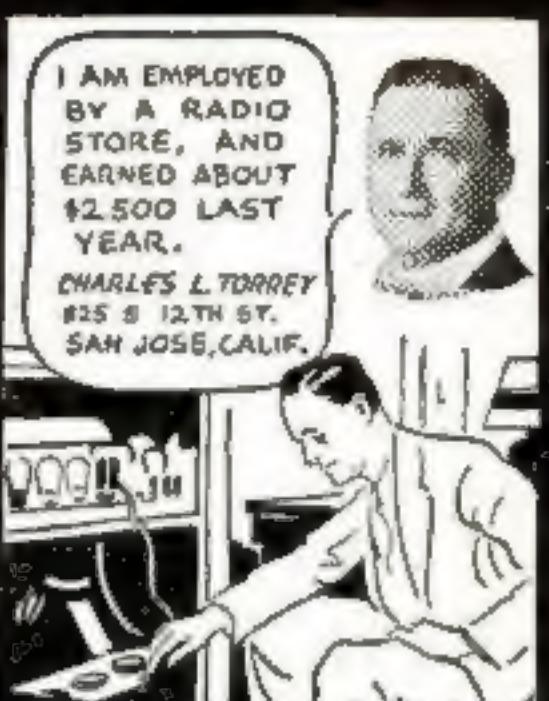
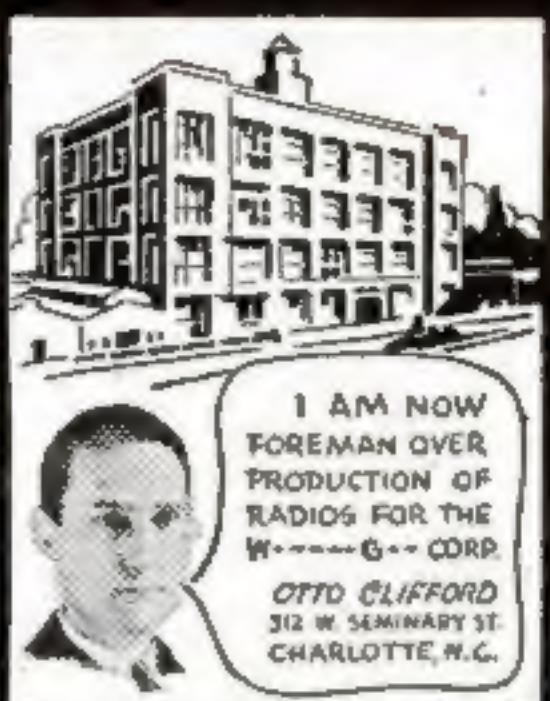
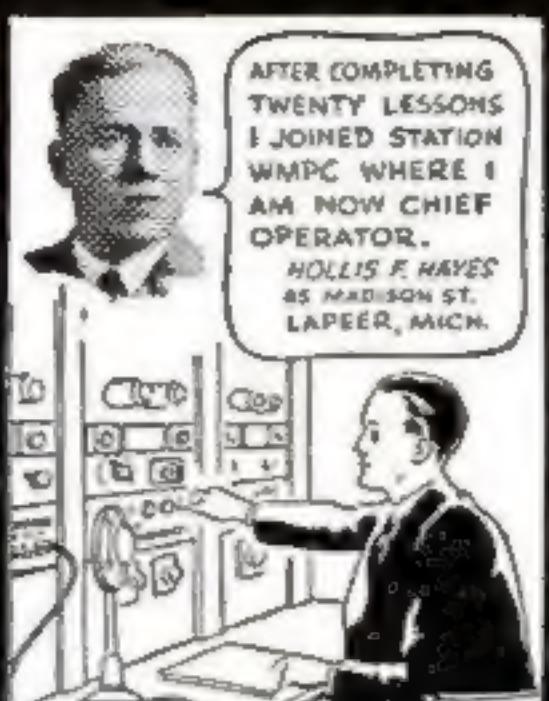
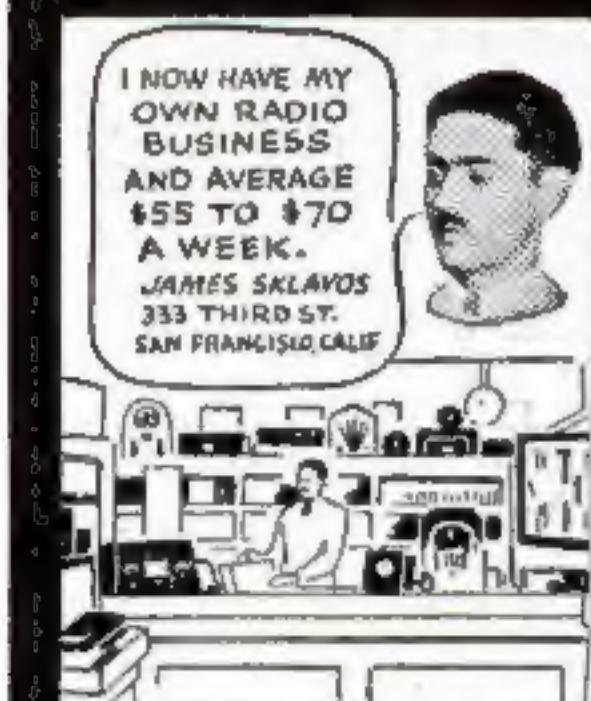
## Is It Filterable or Nonfilterable?

A FRIEND and I have been arguing over a difference of terms, and thought your readers might help us reach a decision. In speaking of the virus, or poisonous entity which is so small that it cannot be brought into view even with the most powerful microscopes, should one refer to it as a filterable or a nonfilterable virus? My contention is that the virus is so small that it passes or "filters" through porcelain, and therefore is filterable. My friend contends that it is so small that (Continued on page 8)

HO HUM, ANYTHING FOR AN ARGUMENT!



# READ THESE 8 True Experiences of Men I Trained at Home For RADIO



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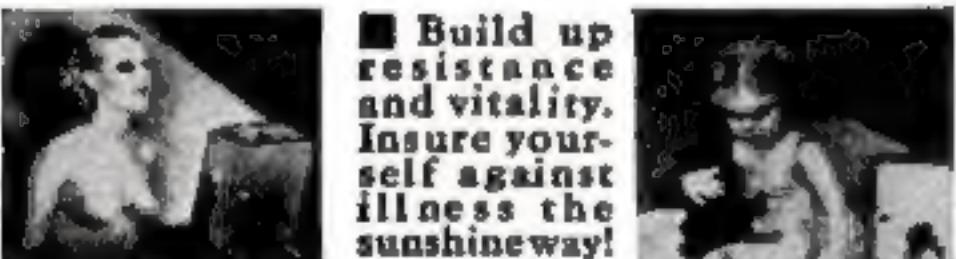
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## Our Readers Say

(Continued from page 6)

it cannot be filtered or "held back" by porcelain, therefore is nonfilterable. The question rests with the definition of the verb "filter," for which my dictionary gives both meanings. Help!—K.L.D., Hammond, Ind.

#### More Monkeyshines for Problem Fans

PERHAPS you can find me an answer to this one: A piece of rope weighs four ounces to the foot. It is passed over a pulley and has pans of equal weight attached to the ends, one empty, and the other containing a monkey. This system is in equilibrium. The weight of the monkey in pounds is equal to the age of the monkey's mother in years. The age of the monkey's mother added to that of the monkey is four years. The monkey's mother is twice as old as the monkey was when the monkey's mother was half as old as the monkey will be when the monkey is three times as old as the monkey's mother was when the monkey's mother was three times as old as the monkey. The weight of the rope is one half as much again as the difference in weights between the empty pan and the pan containing the monkey. How long is the rope?—D.L.H., U.S.S. Monaghan.



#### He'd Get to the Heart of the Shaft-Center Matter

It's an old question, but I still haven't seen it answered in satisfactory fashion: Is the absolute center of a spinning shaft motionless? How about some scientific shark answering this and really explaining it. Even though F.A.C. won't like it, he'll have to admit it's not easy to answer. That was a swell article in the December issue about simple chemical tricks. Let's have more like it.—C.E.S., Niagara Falls, N. Y.

#### Thinks Lettered Car Tags Would Only Spell Trouble

THERE'S just one thing wrong with the suggestion, reported on page 56 of your January issue, of putting words instead of numbers on automobile license plates. Of all the possible combinations of letters that might be used, a certain number would be desirable or at least unobjectionable, but a great many would be an affront to any motorist. For example, I cannot imagine any car owner objecting to the use of a plate bearing the legend O-U-KID or SEE-ME-GO, but there probably would be a spirited protest from the taxpayer who received a tag saying DUMB-EGG or A-LOUSE. It's bad enough now, with the big shots all trying to get low license numbers because they consider these a



proof of distinction. If the word-license plan goes through, there will be a free-for-all fight, and I pity the officials who will have to satisfy everybody. It will be like the old days when the college boys ornamented their jalopies with mottoes like "Honest weight—No springs," "Excuse my rust," and "I do not choose to run."—T.M., Albany, N. Y.

#### Floodlights His Car With Amber Lamp

EFFICIENCY, beauty, and economy in the front lighting of the automobile, all can be had at the price of a little common sense. Many motorists, it seems, have a hankering for a battery of headlights—vain, wasteful and dangerous. Yet, the ordinary headlight dimmers show too little of the road to be useful, except in close traffic. And with the new, amber lights, the fog-penetrating power is offset by the fact that they render details indiscernible. What then? Simply place one amber light in the center of the front bumper, directed at the radiator grill, headlights, and fenders. The reflection is without glare, and sufficient to serve the purpose of dim headlights. One light serves for three, and the effect is beautiful. The car seems luminous. Try it and you will recommend it to your friends.—M.G., Brooklyn, N. Y.

#### Does He Wave a Baton To Keep Time for All Three?

W.W.H., of Woodlynne, N.J., has acquired the art of humming and whistling two different musical tones at the same time. I believe I can go him one better. I can whistle double—that is, whistle two different tones at the same time—and also hum the accompaniment while I'm doing it. Three tones at once. How's that?—R.A., Corvallis, Ore.



#### Still, a Telescope Does the Best Job

THERE is an interesting explanation of the ability of D.P., of Sydney, Australia, to see faint stars better out of the corner of his eye. In the eye's retina, or viewing screen, are rods and cones which are stimulated by images focused upon them by the eye's lens. Rods are more sensitive to light stimuli of feeble intensity than are cones. The fovea, a small area at the center of the retina, contains only cones and, therefore, sees dim lights poorly or not at all. This is the area that sees things we look at directly. Immediately around it there are a few rods, which increase in concentration toward the outer edge of the retina, until there are no cones at all, only rods. This is where light from one side strikes the retina, namely, the area of concentrated rods capable of responding to feeble light stimuli. Hence, it is perfectly logical that when you look up at the night sky, faint stars will appear to one side of where you're looking, and

disappear as you look at them. It is said that some living things, such as snakes, have no rods in their retinas, while the retinas of others of nocturnal habits, such as owls, consist exclusively of rods.—R.J.R., Dolores, Colo.

### Now We'll Have to Publish an Article on Alibis

WHY the recent exposé on gambling? Sure it was interesting; but it certainly has cramped my chances of placing a spare bill or two on my favorite pony. As usual, my wife read the January issue from cover to cover. Now, every time I mention the horses or a sweep-stake, she just opens the magazine to that article, shakes her head, and says, "Sucker." Maybe E. W. Murtfeldt, the author, can answer me this: "What are my chances" of ever placing a bet again? —D.T.S., Baltimore, Md.



### He Doesn't Waste His Film Spools

MAYBE I can help B.H.E., Providence, R.I., who wants suggestions for using empty camera-film spools. Here's what I do with my size 127 vest-pocket spools: The metal-disk ends are removed and used in many places for washers, holes being drilled to suit the different needs. I then use the solid parts of the aluminum centers, up to the slots, to make rivets for mending enamel pans and other things. The aluminum part is held in the lathe chuck and the rivets are turned out. Sometimes the metal disks and the homemade aluminum rivets can be used together to stop leaks in metal containers or mend broken glass. I save the scrap aluminum to cast into something useful.—H.S.M., Bangor, Me.

### Need Articles on Philately for His Stamp of Approval

HAVING been a reader of your magazine for more years than I care to count (out loud), perhaps you will give my letter your attention. May I suggest that the microscopists have had their turn and that the philatelists, whose number is legion, be given their turn?—J.W.C., Winnipeg, Canada.

### He Says the Question Bee Is a Honey

YOU HAVE a very worth-while idea in the new department, "Popular Science Question Bee." It seems to me that the idea could be developed further, however, by splitting it up into four divisions, one with questions about general science, as at present; one with questions about biology, one about physics, and one about chemistry. These are offered by way of suggestion. To add variety, the general-science questions could be particularized in such fields as aeronautics, automobiles, railroading, and other fields, from month to month.—J.A.G., East St. Louis, Ill.



your Patent Application is made; what kind of sketches or drawings are necessary; what other papers must be made out; how the Patent Laws protect you; why it is important to avoid loss of time in getting your application filed; and many other important points. Even a very simple invention, if new and useful, may prove very valuable. You may have much to gain and nothing to lose by sending for this book TODAY.

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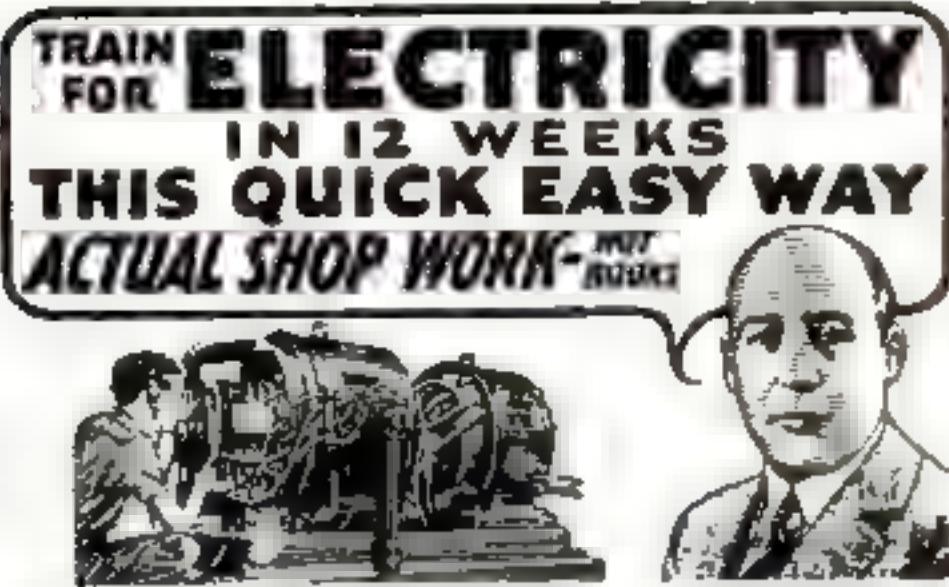
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## HOME-STUDY SUCCESS IN FAR-OFF INDIA

By the advent of the British Government, English became the official and leading language of India. It became so inevitable in the business world, that those who knew no English had but very little chance of progress in their lives.

But the system of English education followed in India was so meandering and costly that only rich people could afford to pay for the same. Unfortunately, I was born of poor parents who had no sufficient income even for the "daily bread." So, after having a primary course of study in a vernacular school, I bid farewell to my school life, at the early age of ten, with a job in view.

As I was young and ignorant of English, no one dared to employ me until after two years, when the Managing Director of \_\_\_\_\_ Bank employed me in his bank. But as I had no proper education in English, I could not find progress in the work. I did not despair in this condition, but decided to learn English. For which, Home Study was the only way found opened before me. My friends who had no faith in Home Study tried to dissuade me in my attempt. But, as Home Study was the only chance left for my progress, I determined to spend a portion of my pay for the same.

Meanwhile, I found an advertisement of the \_\_\_\_\_ School for a two-year course by correspondence. I enrolled with this school and lessons came to me regularly. My friends seeing this began to laugh at me. But being aware of the fact that nothing but mockery would survive to the mocker, I continued my studies confidently. After two years' continuous study in my spare time, I became able to read, write, and speak English tolerably well; and as a result of the same, I was promoted as a clerk and the English correspondent of the bank. Now, to the surprise of my friends who laughed at me, I am drawing one pound and 19 shillings a month. The amount of pay may seem paltry to the sight of an American. Nevertheless, the fact that it is the sole means of living for a family of 8 members, will, I hope, give him an idea of its real value.

Home Study made me able not only to acquire a livelihood but also to write essays for competition and win prizes many a time. Hence, I recommend Home Study to every laborer who had no opportunity to study in his younger days.

K. C. J., Trichur, India.

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## Secrets of Success

### LEARNS SELLING AT HOME DESPITE SKEPTICAL FRIENDS

Salesmanship has always fascinated me. The free life and opportunities involved seemed to offer adventures in living. I began a little research work. In this field, as in any other, I soon discovered that reliable firms only wanted experienced men. After careful investigation I learned that the only way open for me to learn the theory and precepts of Salesmanship was to take a correspondence course from some good home study school. I selected the \_\_\_\_\_ School, after talking to their representative. No sooner had I signed for a course than friends told me that learning salesmanship through a correspondence school was impossible. Undaunted, I went steadily ahead with my studies. Supplementing my regular assignments, I collected everything I could get my hands on pertaining to the subject, and it wasn't long until I had a bulging scrap book of ideas, plans, and methods. In this frame of mind I soon had an urge to try out the practical application of my lessons. To do this I had to resign my small clerkship and get something to sell. This I did. Since that time I have progressed rapidly in my profession and have earned a California teachers credential in Salesmanship, have coached and given field training for 35 California corporations, have had articles accepted by national sales magazines and lectured for several months on the radio as "The Salesmanager." All of this out of such a humble beginning.

I recommend home study to any person who really wants to get ahead in any occupation.—H. E. H., Los Angeles, Calif.

### COMBINES WORK ON FARM WITH ELECTRICAL STUDY —BECOMES EXECUTIVE

Some years ago I was making a fair living on a farm but I had, for years, been interested in electricity in particular, and machinery in general. I had been forced, by lack of funds, to quit college the year before graduation, so I had not been able to take an electrical course at "Tech".

I studied advertisements of correspondence schools—though I had no faith in that kind of school—and, after writing several, I decided on an electric lighting course with one, the \_\_\_\_\_ School. I paid cash for their

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TELLS you exactly how the Patent Laws protect you. Why you need a Patent at all. Explains simple but important steps to take at once without cost to help establish your claim to your invention. Explains what kind of sketch, drawing or model is needed, the preliminary search, how Patent papers are prepared, assignments in return for financial assistance, etc. Also illustrates many interesting inventions, shows you 115 different mechanical movements that inventors have used in working out ideas, and much more. Inventors the world over have welcomed this book. We gladly send it with our compliments to any serious, interested man.



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#### Tells How to Go About Selling an Invention

Tells you how in an inexpensive manner you can bring your invention to the attention of prospective buyers. Suggests the proper time to take such step. Outlines methods other inventors have used successfully in selling and marketing. Remember, an invention isn't enough. A Patent isn't enough. You must also know how to cash in. This book deals with that subject. Also sent to you free and without slightest obligation. Mailed the same day we hear from you.

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### Secrets of Success

course so as to save all I could on it, and got down to work every spare hour the farm permitted. I made real high grades and progressed nicely, finding the course splendid and the school ready to give every possible assistance and teaching. After a few months' study, I got in touch with a city water, light, and gas department with which, 14 months after beginning my course, I made a start as meter reader. In this work, I had a chance to get practical, applied knowledge in electric lighting, water distribution, and gas manufacture, distribution, and appliances. I also made friends with all employees, learned the nature of their duties and just what was and what was not done.

I had had several years' experience in economical business management and these, combined with study of my course, the water, light and gas magazines, and everything worthwhile I could learn about the business. So in ten months I was offered a place in the superintendent's office, a splendid salary increase, with the active direction left mostly to me. This promotion was due, of course, to my correspondence course, hard work, and a desire to learn and get ahead. So I found out that a correspondence course, from a reliable school is OK—especially for the person who is honest with himself or herself and is determined to succeed—for it takes real application.

B. P. G., Washington, D. C.

### More \$5 Prize Winners

THREE prize winning letters in POPULAR SCIENCE MONTHLY'S new Secrets of Success contest—"What Home Study Has Meant to Me"—are printed above. Read these stories carefully because your own career may be just as interesting and inspiring to other readers. If you think so, put it down on paper and send it in. We will pay \$5 for every letter we publish.

#### CONTEST RULES

Only letters from bona fide home-study school students will be considered and these must contain the name of the school and the name of the company, or companies, for which you have worked since graduation. (Names, however, will be deleted from the letters when published.) We also want to know the kind of course you took and the type of position you have held. Your own identity will be kept anonymous, if desired.

We are interested in facts, not literary ability, but please write clearly, completely, and keep your letters within 750 words. We are not looking for "get-rich-quick" stories or freak adventures, and authors must be prepared to substantiate the truth of the statements. Manuscripts submitted and printed become the property of this magazine, and we are not responsible for the return of rejected letters unless sufficient postage is provided for this purpose. Address your contribution to Success Story, 353 Fourth Avenue, New York, N. Y.

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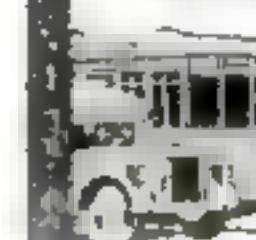
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## New Heavy Alloy for Radium-Ray Shields

HALF AGAIN as heavy as lead, an inexpensive new alloy will help protect doctors and hospital workers from the dangerous rays of radium. Tiny bits of the precious element have hitherto been kept in "safes" or containers made of lead, because this was the heaviest metal obtainable at any but a prohibitive price—and the heavier a metal is, the more effectively it prevents the escape of the rays. Better and less bulky containers can now be made of the new alloy, which consists of tungsten, copper, and nickel. Tungsten alone would provide the added weight, but the metal melts at the sky-high figure of 6,000 degrees F., and it would be impracticable to try to heat a mass of 100 or 200 pounds to this temperature. Adding relatively small quantities of copper and nickel to powdered tungsten, it has recently been discovered, enables the mixture to be shaped in molds at only 2,600 degrees F., or within a few degrees of the melting point of iron. The resulting ultra-heavy alloy may also find application in rotors for gyroscopes, and in balancing weights for the motors of airplanes and racing cars. Another of its properties, extremely low volatility at high temperatures, enables it to withstand the destructive effects of electric arcs and therefore passes its use in contact points for circuit breakers that interrupt superpowerful currents of thousands of volts and amperes in industrial or other power lines.

## Electric Forceps Locate Metal Lodged in Body

ATTACHED to a pair of surgical forceps, a signal-lamp device just invented will give the surgeon a "go-ahead" signal during the course of an operation. When pieces of metal lodged within the body are being located by probing, electrical connections on the prongs of the forceps will make contact and light the signal lamp only when the metal is seized in the proper position for removal. The lamp, which is used in conjunction with X-ray apparatus, will not function when the forceps contact ordinary body tissues which provide inadequate conductivity.

## Slow-Motion Lightning Produces No Thunder

"SLOW LIGHTNING" that produces no thunder has been discovered as the result of studies made by General Electric engineers, who found that electrical currents occasionally are built up and released slowly, that is, in one or two tenths instead of millionths of a second, as in conventional lightning. Although slow lightning looks like "fast" lightning, its existence may explain why during a storm some flashes are not followed by thunder.

# Accountancy Home-Study made interesting and practical thru problem method

**Y**OU know as well as we do that Accountancy fits many men for positions that pay three and five and ten thousand dollars a year—gives many other men unusual opportunity to start a profitable growing business of their own.

The only question is—just how practical is it for you to train yourself adequately in Accountancy through home study?

And the answer lies in the LaSalle Problem Method.

For this modern plan of training not only makes Accountancy study at home thoroughly practical but makes it interesting as well.

And here's how:

### You Learn by Doing

Suppose it were your privilege every day to sit in conference with the auditor of your company or the head of a successful accounting firm. Suppose every day he were to lay before you in systematic order the various problems he is compelled to solve, and were to explain to you the principles by which he solves them. Suppose that one by one you were to work those problems out—returning to him every day for counsel and assistance—

Granted that privilege, surely your advancement would be faster by far than that of the man who is compelled to pick up his knowledge by study of theory alone.

Under the LaSalle Problem Method you pursue, to all intents and purposes, that identical plan. You advance by solving problems.

Only—instead of having at your command the counsel of a single individual—one accountant—you have back of you the organized experience of a great business training institution, the authoritative findings of scores of able accounting specialists, the actual procedure of the most successful accountants.

Thus—instead of fumbling and blundering—you are coached in the solving of the very problems you must face in the higher accounting positions or in an accounting practice of your own. Step by step, you work them out for yourself—until, at the end of your training, you have the kind of ability and experience for which business is willing and glad to pay real money—just as it was glad to pay these men.\*

### Five Men Who Tested and Proved It for You

For instance, there was the plumber who started Accountancy training with us in 1916. After a short period of study, he took a position as bookkeeper for a year, and then became accountant for a leading automobile manufacturer—

with two bookkeepers under him. Later he became auditor of one of the foremost banks in his state with his salary 325 percent larger than when he started training.

He wrote, "My training is the best investment I've ever made, showing a cash value running into five figures."

And the young clerk, earning \$75 a month and then getting many times that as general auditor for an outstanding, nation-wide organization. Within six months after he began our training, he was earning \$125 a month and within four years, he was earning \$250.

Do you wonder that he writes, "While LaSalle ads once seemed like fairy tales to me, now I know from personal experience that they are true"?

Or let us tell you about two men—one a stenographer and the other a retail clerk—neither of whom knew more than the simple elements of bookkeeping. One is now the comptroller and the other the assistant comptroller of a large company.

"LaSalle training in Higher Accountancy," write both, "was the important factor in our rapid climb."

And if you are thinking about the C. P. A. degree and a public accounting business of your own, read about the pharmacist who was earning \$30 a week eleven years ago when a LaSalle registrar secured his enrollment for Accountancy training. Eight months later he left the drug store to take a bookkeeping job at \$20 a week—less money but larger opportunity. Three years later he passed the C. P. A. examination and a year later yet he was earning \$5,000 a year. Now he has his own highly successful public accounting firm for which he says, "My LaSalle training has been largely responsible."

### One-Tenth of All C. P. A.'s Are LaSalle Trained

If you want still more proof, remember that 1,600 C. P. A.'s—approximately one-tenth of all those in the United States who have ever passed the difficult examination for this coveted certificate—are LaSalle trained.

Or remember that in our files—accessible on request—are thousands of letters from our Accountancy graduates reporting material increases—some double, triple—and even more—over their original earnings.

And knowing these facts, ask yourself if there can be any further question about the practicability of this training for you—ask rather if the real question is not about the size of your own ambition and the quality of your determination.

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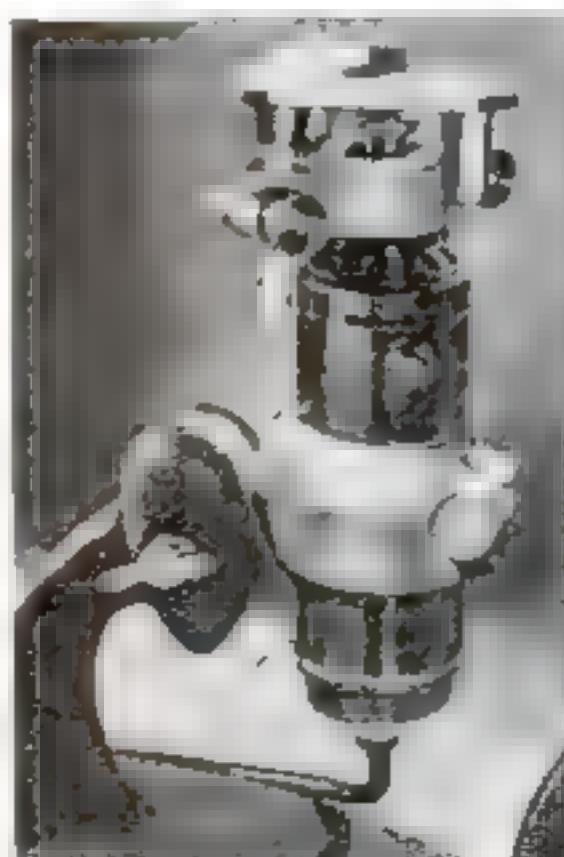
Framework of a house with boxes of plaster board stacked to form walls. Concrete will be sprayed over and around these. In circle, workmen are seen gunning concrete onto the edge of the roof. Below, how the hollow rectangular "bricks" are shaped out of strips of the flat plaster board

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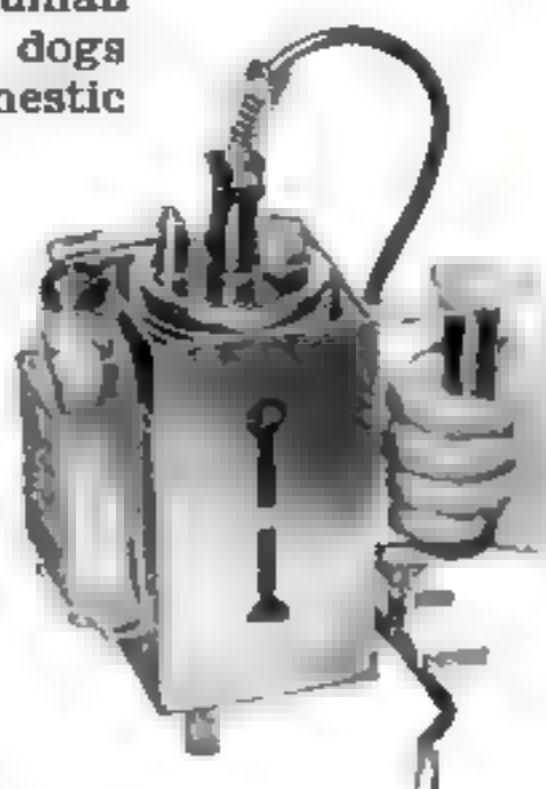
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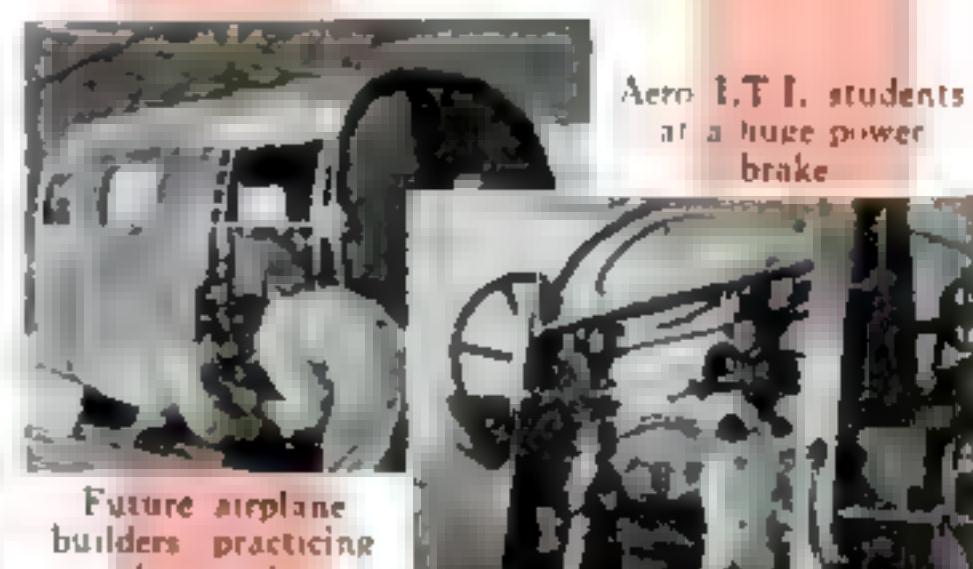
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oil and turpentine in equal parts, together with enough dry coloring such as burnt umber or lampblack to give the desired tint.

### Water Stains from Shellac

Q.—WATER spilled from our breakfast table has made white spots on the shellac-finished floor. How can these be removed?—J. K. B., Sarasota, Fla.

A.—ALTHOUGH you may have to scrub the floor with a varnish remover and refinish it, you might try wiping the spots with a cloth saturated in denatured alcohol.

### Cementing Joints in Leather

H. G. R., HUDSON, N.Y. Joints in leather can be made with ordinary rubber cement of the kind used in repairing automobile tires. Roughen the surfaces of the leather, apply a thin coat of cement, and allow it to dry thoroughly. Do the same with a second coat of cement, then press the parts firmly together.

### Tightening Nails in Plaster

R. U., JEFFERSON CITY, Mo. When a nail that has been driven into a plaster wall becomes loose, it can be made rigid by the following method. Remove the nail, and wrap around it some sort of wadding that has been saturated in glue. Put the nail and wadding back into the hole, pressing in firmly. Use enough wadding to fill the hole formed by the loose nail.

### Estimating Shingle Nails

Q.—IS THERE any rapid way of estimating the number of four-penny nails required for a shingling job?—R. M. S., Paterson, N.J.

A.—A REASONABLY accurate method of determining how many four-penny nails will be required for shingling is to figure the amount on the basis of five pounds of the nails for each thousand shingles to be used.

### Adjusting Gas Flames

Q.—WHAT is the proper color for the flames on the burners of a kitchen range using ordinary commercial illuminating gas? I am anxious to get maximum efficiency for cooking.—K. R. O., York, Pa.

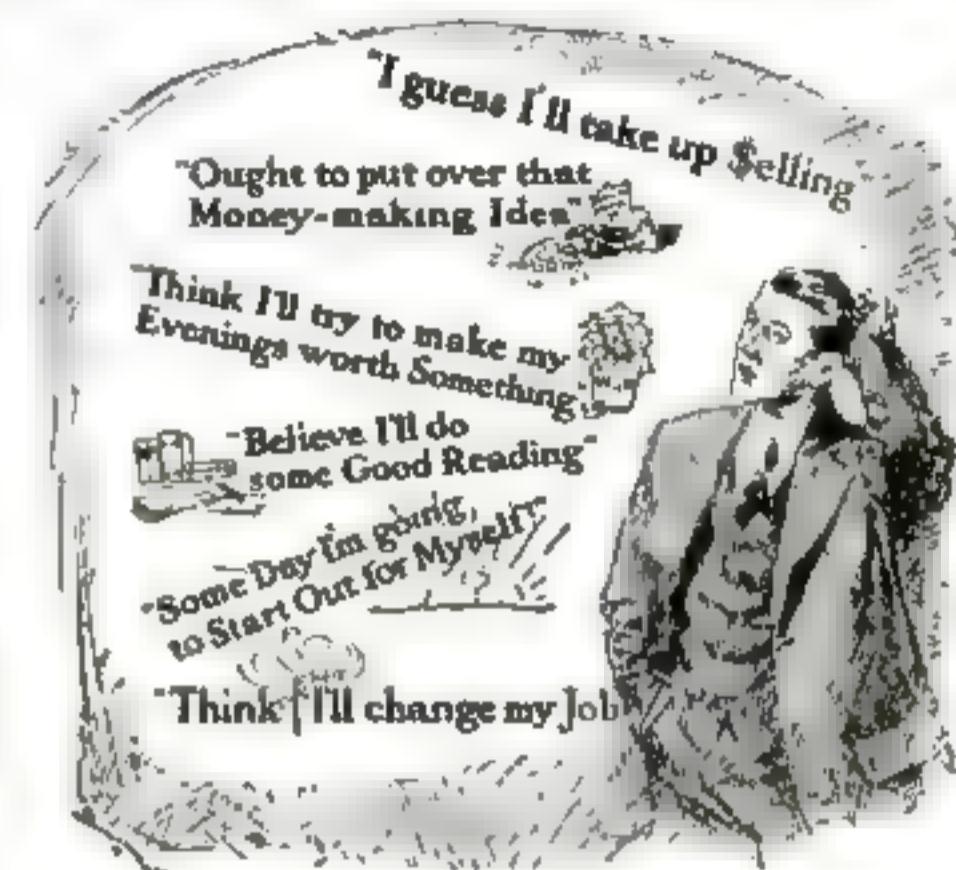
A.—THE most efficient adjustment is obtained by turning the air shutter until the flame is of a greenish-blue color and as lively as possible.

### Painting Window Screens

Q.—CAN you name several preparations for preserving window screens?—M. C. L.

A.—EITHER use regular screen enamel or an asphaltum varnish thinned out with turpentine. Boiled linseed oil, with a little turpentine and sufficient lampblack added, is very easy to apply with a small piece of close-grained sponge. If the screen is of a galvanized material, alternate this treatment from year to year with spar varnish thinned out with turpentine.

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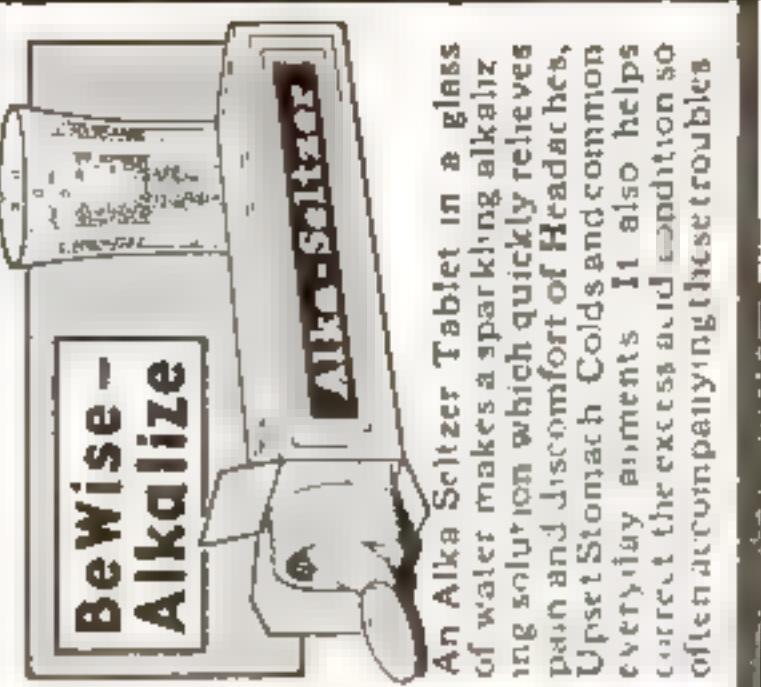
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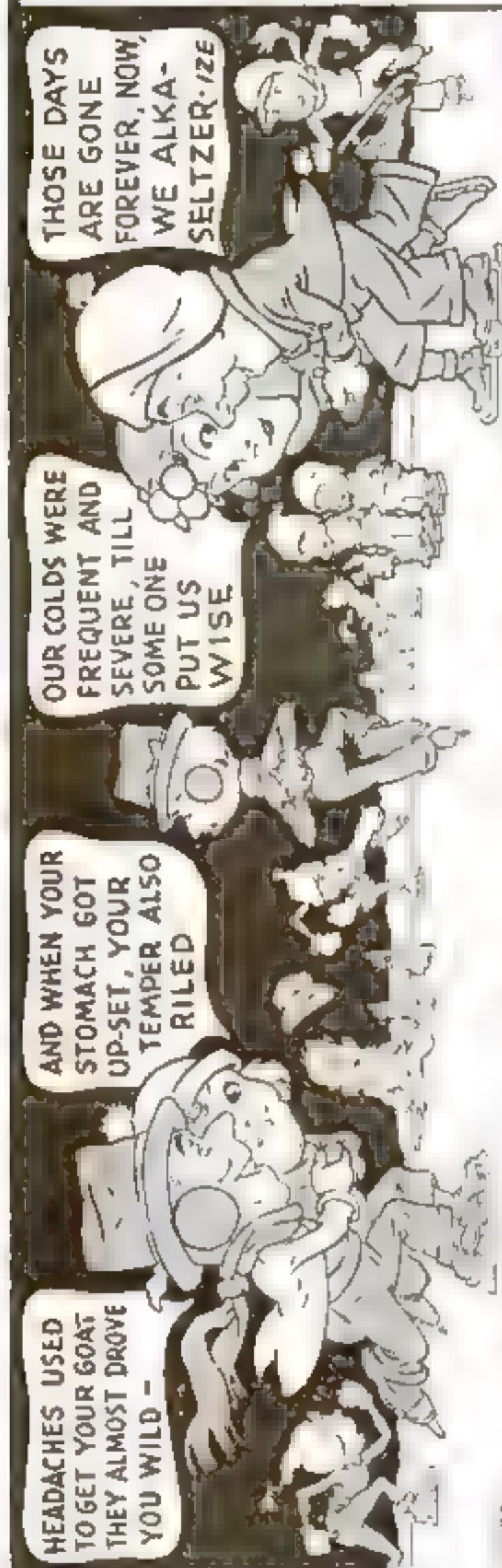
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Many a bargain-buy in the New Classified Section beginning with this issue. See page 20

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## Odd Earthquake Lights Studied by Scientists

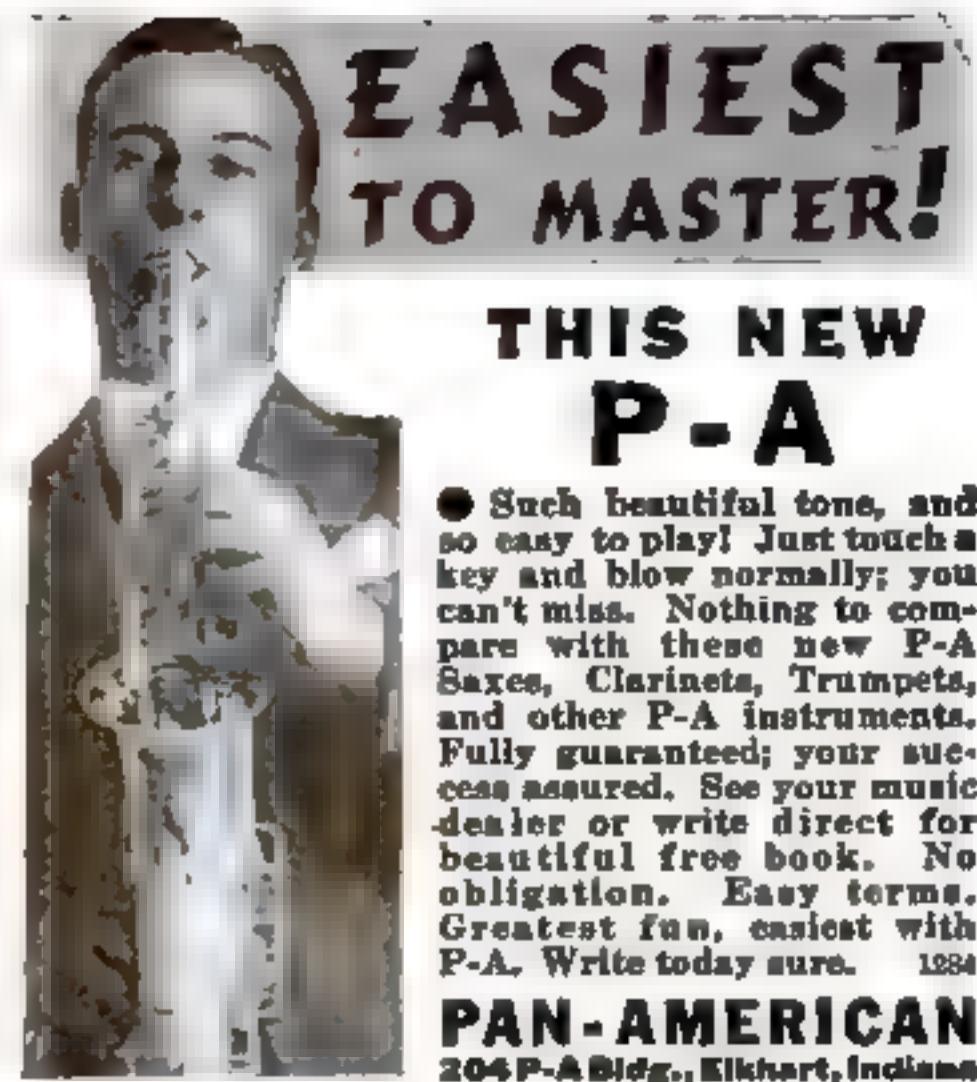
OBSERVERS who have reported seeing globes and beams of fire, sparks, luminous clouds, and flashes like lightning in the sky, during destructive earthquakes, have finally been cleared of the charge of being victims of an overactive imagination. The phenomenon does exist, the latest scientific opinion concedes, though its cause remains baffling.

"Earthquake lights" first were reported in the year 89 B. C. Twenty-eight years ago, an Italian, Prof. I. Galli, catalogued 148 luminous displays observed during earthquakes. Seismologists remained skeptical, nevertheless, until the great Japanese earthquake of 1930, when two members of the Earthquake Research Institute of Japan witnessed at first hand one of the most vivid examples on record. They supplemented their own observations by those of 1,500 others. Most of the observers saw the night sky lighted up with flashes resembling sheet lightning, but of longer duration. Where the ground rocked most violently, at the center of the earthquake area, lights were seen dancing fitfully in every direction, and a row of balls of fire appeared in one part of the sky. On the east side of Tokyo Bay, observers saw beams like auroral streamers radiating from the horizon. In a suburb of Tokyo, the landscape was lit up more brilliantly than by moonlight, and in the city itself, objects in an unlit room became plainly visible. Some observers reported the light as pale blue or white; others, as reddish or orange in color.

Commencing just before the earthquake, the luminous displays continued until some time afterward, reaching their height at the time of the most severe shocks. Weather records show there was no thunderstorm at the time, eliminating lightning as a possible explanation. Sparks from broken high-voltage electric wires could not have been responsible, as the lights were seen in many places where there were no such wires. The luminous displays apparently could be traced only to the earthquake itself.

## New Chemical Makes Clothing Stainproof

CLOTHING made of fabrics treated with a new chemical is not only protected against water, coffee, and fruit-juice stains, but can be cleaned simply by a brisk shaking. Bathing suits so treated will dry almost at once, and silk dresses and sheer stockings shed rain, muddy water, and other liquids by the easy expedient of shaking them out. Usual waterproofing methods close the spaces between threads with some such material as rubber. The new chemical combines with the surfaces of the fibers, causing liquids to run off them as rapidly as from a red-hot stove. It is reported to be equally successful on wool, cotton, silk, or rayon.



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## Colored Fly Paper Attracts Insects

FLY PAPER in blue and red, instead of the customary yellow, is the invention of William S. Kell, of Upper Darby, Pa. Moreover, the new paper contains blocks on which there is no sticky substance at all. These blocks are criss-crossed by paths of rough paper, leading towards sections treated with the adhesive. Kell based his invention on the knowledge that flies are attracted by certain colors—including blue and red—and repelled by others, and that they prefer to walk on rough, rather than on smooth, surfaces. The ordinarily wary house fly is attracted by the colored paper, alights on it and, if it lands on an untreated section, seeks out the rough paths which it follows to its doom.

## Whiskers Grow Faster in Warm Weather

WHISKERS grow faster in warm weather than in cold, according to studies made during the course of an entire year by Dr. Paul Eaton of the Florida State Board of Health. Dr. Eaton measured samples of his beard shaved from the same section of his face at approximately the same hour every day for a year. He found that the samples, washed clean of shaving soap and dried, measured on the average .305 millimeters in length in January. From February until September, the measurements, made under a microscope, increased until they were a half a millimeter. During the year, the entire growth of the experimenter's beard was a little more than six inches.

## New Automatic Stove Prepares Entire Meal

SEVERAL cooking compartments, each controlled by its own thermostat, make up a new type of stove that automatically prepares a complete meal. Foods are fed to the various compartments by individual conveyor belts that travel at predetermined speeds, and the amount and quality of the cooking are regulated by the speed of the belts and the temperatures within the compartments. The various dishes of a single meal are routed through the stove so that they all will be finished and ready for the table at the same time, according to the inventor. The device fries, roasts, boils, or broils foods as desired.

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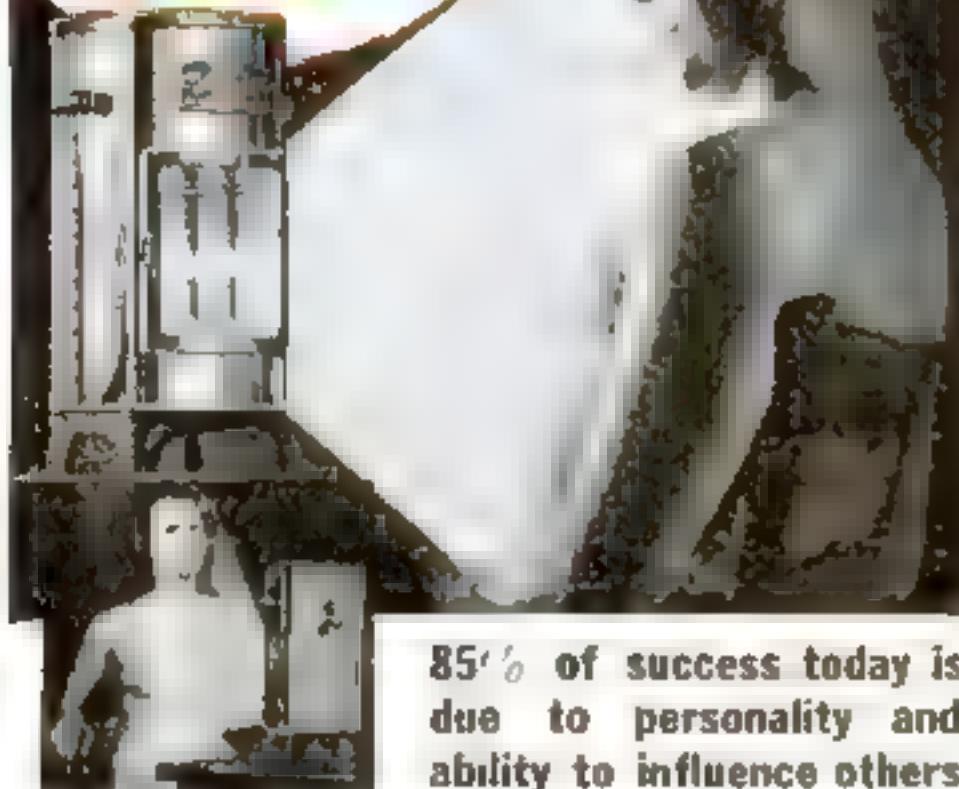
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## Salt Water Turns On Lifeboat's Lights

GOOD electrical conductivity of salt water is the basis of an invention by Gunnar A. F. Winkler, of Worcester, Mass., to insure the automatic lighting of a lifeboat light as soon as the craft is launched from a sinking ship. Many lives have been lost in past wrecks because the lifeboats have been difficult to see in the darkness of a stormy night. Automatic lights on the boats would make them easily found and would guide swimmers to them. The inventor has incorporated a well in the generator which supplies current to the lights. As soon as the lifeboat strikes the water, this well fills with the brine which bridges the gap in the electrical wiring and lights the lamp. The light stays lit until the boat is hauled out of the sea. The salt water then runs out of the generator well and breaks the circuit, automatically turning off the lamp.

## Find Missing Element With Spectrograph

ELEMENT number eighty-seven, the next to the last of the missing elements in the periodic table worked out according to relative atomic weights, has been discovered in France by Horia Hulubei, according to an advance announcement made by Dr. F. R. Hirsh, Jr., of the California Institute of Technology. The discovery was made possible by the use of a delicate instrument, known as the curved-crystal focusing spectrograph, so sensitive that it can detect one part of a given element in 10,000,000,000 parts of a chemical or mineral substance. Dr. Hirsh, one of the seventeen or eighteen scientists who have been hunting the previously missing element, predicted that ekaiodine, the sole element yet to be discovered, may also be isolated by the same spectrograph apparatus.

## Signal Device on Bus Reports Its Position

COILED WIRES on bus roofs in London, England, now enable a central despatching office to keep track of the vehicles throughout their runs. At intervals along the route, the busses pass under single wires stretched across the street. These wires pick up electric signals given off by the coils, which are charged with alternating current, and transmit them to the despatching office over ordinary telephone circuits. As each roof coil is tuned to a different electric frequency, it gives off a signal which distinguishes it from all others. Thus, in the manner of the block system on a railroad, the coils and suspended wires enable the bus despatcher to identify all of the vehicles and to know the approximate location of any one at any given time.

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## Novel Vibrator Speeds Highway Rebuilding

VIBRATION has been put to work in a novel "shakedown" method of highway construction devised by William P. Day, of Cleveland Heights, Ohio. The inventor reports that it eliminates the use of a steam roller, makes possible roads that can be used almost as soon as they are laid, and enables a saving of from fifty to seventy-five percent in the costs of turning an old road into a new one.

The first step is the breaking up of the old highway with compressed-air drills. The fragments are sorted into large and small pieces. Then, workmen spread a layer of the large chunks on the old roadbed. On top are placed the smaller pieces, after which the special vibrating machine applies violent and rapid vibrations to the road. These run from 2,000 to 4,000 a minute. This shakedown process causes the smaller pieces to settle into the cracks. As the final step, grout, a fluid mixture of sand, cement, and water, is spread over the road and vibrated down into the cracks to form a solid whole.

Traffic can be sent over the new highway almost immediately, according to the inventor, as the absence of spaces and the compactness of the vibrated pieces permit this quick use. The new method of construction can be applied to concrete, macadam, brick, or stone roads. In some cases the cost is only one-quarter that of putting down a new concrete highway. Neither steel reinforcing screens nor expansion joints are required. Yet, the inventor reports, the rebuilt roads are as strong as the original highways and in some cases even stronger.

## Bug Poison To Be Pink To Avoid Accidents

ARSENATES, the deadly white poisons used for killing insects, are to be colored pink in the future to prevent their being mistaken for flour or sugar, which they resemble. A number of fatalities have resulted from such mistakes in the past. After studying the best way of avoiding such accidental poisonings, the Manufacturing Chemists Association decided to color arsenates pink so they can be recognized instantly.

## Coconut Shells Used in New-Type Ukelele

COCONUT SHELLS are used in a new-type ukelele designed by Anthony G. Cox, of Honolulu, Hawaii. From one to three of the shells, cut in half, are attached to a mahogany sounding board equipped with the usual bridge and strings. According to the inventor, the novel musical instrument emits a highly pleasing sound. The hardness of the shells and a small space at the joint between the sounding board and the shells contribute to the beauty of the tone.

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What ancient Roman silver coin was the "penny" of the New Testament?

How is a "rainbow" produced?

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## New Electric Bulb Will Not Turn Black

BUILT into an electric-light bulb, a metal screen just invented by Richard E. Smith, of East Cleveland, Ohio, is said to prevent the lamp from blackening during its useful life. Blackening of the inner surface of the bulb, caused by vaporized metal from the filament settling on the glass, cuts down the amount of light radiated, and is especially prevalent in the gas-filled type of bulb in general use. Surrounding the filament, the new screen prevents metal deposits on the glass and thus lengthens the maximum lighting efficiency of the bulb.

## Radio Map Simplifies Tuning of Receivers

TUNING radio stations is greatly simplified by a new chart which is used in conjunction with the tuning dials of the radio receiver. The chart, in effect a map, shows the locations of stations by means of dots, each of which is connected by a line to a regular tuning scale running across the bottom of the chart. Umberto Quintavalle, of Milan, Italy, inventor of the unique system, explains that when the listener wishes to tune in a station shown on the map, he merely turns the radio-tuning knob until an indicator points to the end of the line representing the desired station.

## Preserve Human Skin for use in Grafting

PRESERVING skin of human corpses for grafting on living persons suffering from burns or certain skin diseases, is being carried out successfully by Russian scientists who already have adopted the practice of preserving the blood of corpses for later transfusions, and the eyes for grafting of their transparent fronts or corneas. Skin grafting has been used for years, the skin being taken from another part of the patient's body, or furnished by a donor, much as blood is furnished by donors for transfusions. Pieces of skin from dead bodies are now being removed regularly in Odessa, stored in refrigerators, and used when needed. How long stored skin will keep has not been determined, but it is conjectured that, like blood taken from dead persons, it may last indefinitely.

## Tooth-Brush Bristles Are Made Germproof

BRISTLES, impregnated with a non-poisonous germicidal mixture, make a new tooth brush an antiseptic as well as a cleaning agent. The bristles are also impervious to water. Two Massachusetts inventors, Warren E. Hill, of Northampton, and Clifford L. MacArthur, of Cambridge, devised the new tooth brush which soon will be placed on the market by an eastern concern.

# Enjoy One of the Best Jobs in Industry

## Steady Work

As nearly all manufacturing—construction—building starts on the drafting table, the draftsman is one of the first to be hired and one of the last to be laid off. It is his blueprints, his specifications, that give the last word in what the workmen are to do. No article, building or construction job is started before the plans drawn by the draftsman have been officially approved.

## Good Pay

The draftsman has been called the Junior Engineer which title just about describes his work, position and pay. He combines his knowledge of principles, mechanism and construction details with the ability to draw plans and indicate motions and methods on paper. On the average, his salary is considerably above the wages of the mechanic and, of course, less than that of the engineer.

## Promotion

Developing plans, new machines or new construction methods—the draftsman works directly with important men of the organization. So he knows what is being considered and planned. It may be the superintendent—engineer—even the prospective buyer with whom he consults. These contacts, plus his experience and general knowledge of the business, place him in an excellent position for promotion when next there is a good opening.

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## Become a Draftsman

## A Job Where You Are Not Old at 40

Athletes, farmers, and factory and shop workers who rely on muscle start growing old even before they reach 40 while office workers, executives, teachers, professional men—in fact, all kinds of brain-workers—are just approaching their prime at 40 to 50. Training increases your value AT ONCE and continues to help boost your earning power as you mature and as you increase your experience and background for forming judgments of your firm's policies and methods.

## Security for Yourself and Family

Even if you now are only 18, 25 or 30, you should look ahead—begin training TODAY for the job you want at 50. Training helps you to be independent—self-supporting. It helps you to enjoy associations that are denied the untrained man. Training helps you to increase your earning power more QUICKLY—and by so doing to offer members of your family advantages far in excess of what you could give them as an untrained man. Train and enjoy PROGRESS—CONTENTMENT—INDEPENDENCE.

**American School, Dept. DD-246, Drexel Ave. at 58th St., Chicago**

## Smoke in the Air Costs Millions Yearly

SMOKE in the atmosphere causes an annual loss of from ten to thirty dollars for each person in the United States, according to estimates recently made public by the U. S. Public Health Service. Damage caused by smoke includes disfigurement of buildings, soil-

ing of clothes, spoiling of merchandise, injury to grass and plants, and loss of sunlight. In urban centers, it was found, the amount of material deposited by smoke-laden air ran as high as 2,000 tons to the square mile within a period of only twelve months.

## Tattooing Cornea of Eye Improves Vision

TATTOOING the cornea, the transparent layer that forms the outer covering of the eyeball, with gold and platinum improves certain cases of defective vision, according to Dr. Ramon Castroviejo of Columbia Presbyterian Medical Center, New York City. Dark spots that

develop on the eyeball covering greatly interfere with normal vision, it is explained, by dispersing light that passes through the translucent area. Tattooing with metal chlorides in solution closes up the spaces between the spots, concentrating the light received.

## New Stratosphere Balloon Has Twin Gas Bags

DESIGNED to reach a record height of twenty miles, six miles higher than present records, a gigantic stratosphere balloon is under construction by Polish engineers. Far larger than any balloon yet built for the purpose, the Polish craft actually is composed of two bags, one above the other. During the first part of an ascension, the smaller bag alone contains the hydrogen gas and lifts the larger bag, which is empty.

As the altitude increases, the gas is forced by expansion into the lower bag through a connecting tube. Heretofore, ascensions were limited by the amount of gas a single bag would hold and, when its capacity was reached through gas expansion, the gas escaped and the ascension halted. Suspended beneath the odd lighter-than-air craft is a conventional sealed gondola for observers and instruments.

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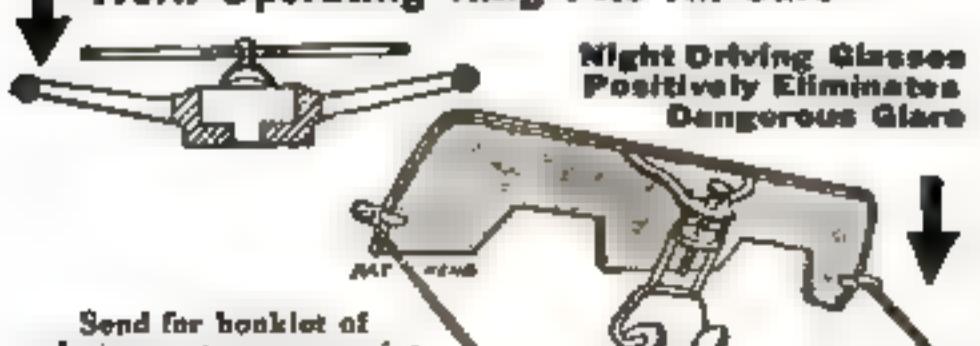
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## CONSTRUCTION KITS

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The original boat was a steam sloop, bark rigged. In two years during the Civil War she captured more than sixty vessels. You can make a model of her with our new kit 10S. The model has a 21½-in. hull and is 28 in. over all. All the necessary raw materials, as well as complete blueprints, are included in the kit.

For the benefit of model railway fans, we have added two kits for making 25 ft. of HO track. The regular kit 3L costs \$4.00 and the deluxe kit 4L costs \$6.95. Included in the latter kit are third-rail chairs, which are drilled and counterbored for escutcheon pins and slotted to accommodate the rail, thus eliminating a great deal of the soldering.

Our complete list of kits follows:

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- A. Whaling ship *Wanderer*, 20½-in. hull, 27½ in. over all..... 7.40\*
- D. Spanish galleon, 24-in. hull, 30 in. over all..... 6.95\*
- E. Battleship U.S.S. *Texas*, 3-ft.... 7.45\*
- G. Elizabethan galleon *Revenge*, 25-in. hull, 28 in. over all..... 7.25\*
- L. Farragut's flagship *Hartford*, steam-and-sail sloop-of-war, 33½-in. hull, 41 in. over all..... 8.45\*
- Q. Privateer *Swallow*, 12½-in. hull, 20 in. over all..... 4.95†
- V. Clipper *Sovereign of the Seas*, 20½-in. hull, 26 in. over all.... 4.95†
- Y. Trading schooner, 17½-in. hull.. 4.90†
- 2S. U. S. Navy destroyer *Preston*, 31½-in. hull..... 5.95\*
- 3S. Constitution ("Old Ironsides"), 21-in. hull, 31 in. over all..... 6.50\*

(Continued on page 29)



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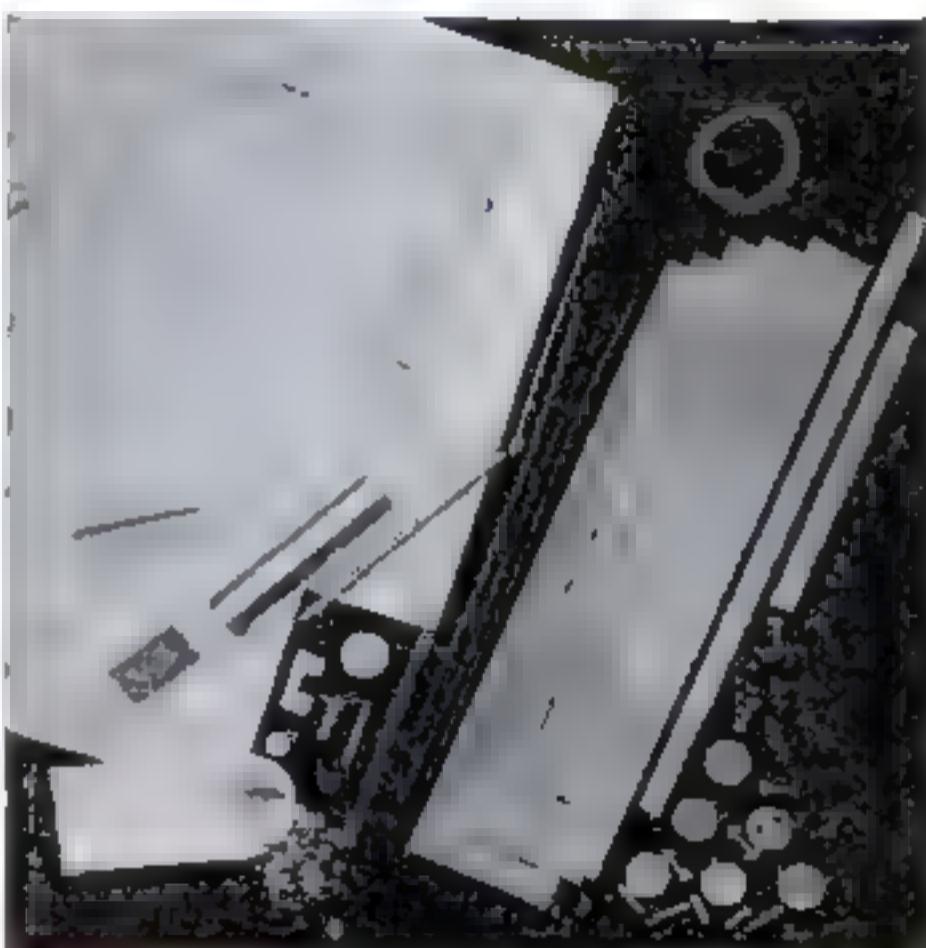
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## Kits for Fine Models

(Continued from page 28)



**Kit 1L**—All the materials necessary for building an HO-gauge model locomotive

4S.	Clipper ship Great Republic,	31½-in. hull, 42 in. over all ....	8.40*
5S.	Coast Guard patrol boat of new 165-ft. class, 20½-in. hull .....	4.95*	
6S.	Brig Malek Adhel, ¼-in. scale, 20-in. hull, 33 in. over all, frame-and-plank construction .	9.75†	
8S.	Fishing Schooner Bluenose, 17½-in. hull, 22 in. over all ....	4.95†	
9S.	Whaleboat, 14 in. long; partly shaped hull and raw materials for making all equipment.....	2.75†	
10S.	Confederate raider Alabama; steam sloop, bark rigged; 3/32-in. scale; 21½-in. hull, 28 in. over all .....	8.20*	

### SIMPLIFIED SHIP MODEL KITS

F.	Liner S.S. Manhattan, 12-in....	1.00
H.	Cruiser U.S.S. Indianapolis, 12-in. ....	1.50
J.	Clipper ship Sea Witch, 13-in... 1.50	

### MODEL-OF-THE-MONTH KITS

M.	Aircraft carrier Saratoga, 18-in. 1.00
N.	Four U.S. destroyers, each 6½-in. ....
R.	U. S. cruiser Tuscaloosa, 11½-in. ....
U.	Hispaniola, the ship in "Treasure Island," 7-in. ....
Z.	H.M.S. Bounty, 11½-in. ....
2M.	Ocean freighter, 14-in. ....
3M.	Yacht Nourmahal, 8½-in. ....
4M.	Oil tanker, 14-in. ....
5M.	Liner President Lincoln, 14½-in. 1.50

### MODEL RAILWAY KITS

1L.	Model locomotive, Hudson type HO gauge. Kit contains all the necessary sheet brass, brass tubes, rods, wire, springs, fiber, screws, boiler head, ladder strip, six driving wheels, and ten pairs of wheels. ....	9.95*
-----	---	-------

(Continued on page 30)



Model of whaling ship made with Kit A



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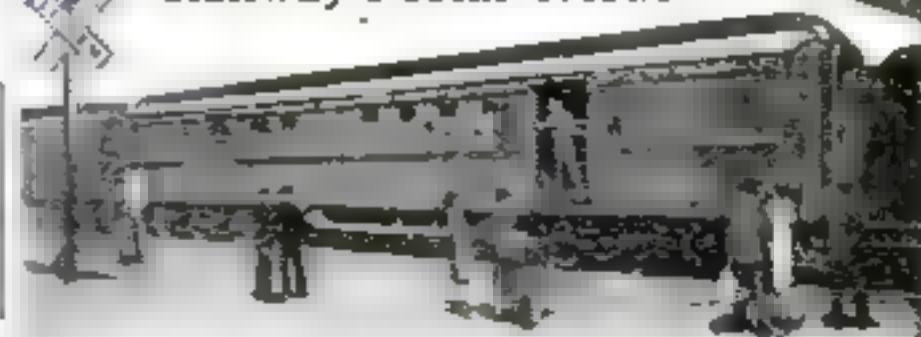
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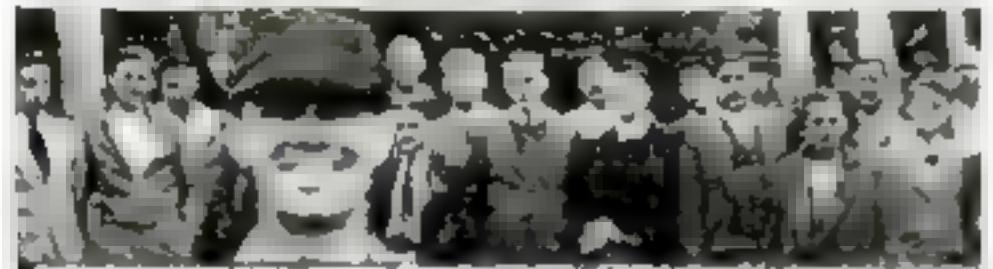
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## Kits for Fine Models

(Continued from page 29)

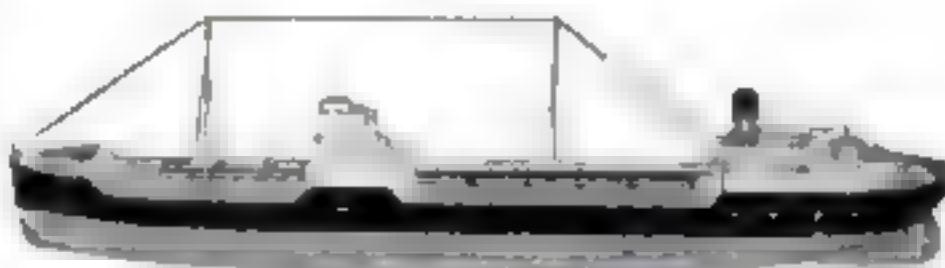
Kit 2S—U. S. S.  
"Preston," 3 1/2-in.  
destroyer model



- |  |       |
|--|-------|
| 2L. Supplementary power unit for the locomotive 1L. Consists of specially built electric motor (6-v.) and worm and gear.....           | 4.50  |
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| 4L. Deluxe track kit. Same as 3L except that kit contains third-rail chairs, which eliminate soldering of rail to heads of nails ..... | 6.95* |

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| No. 4. Solid mahogany book trough 22 1/2 in. long, 9 1/2 in. wide, and 24 1/2 in. high over all. Ready to assemble, with finishes..... | 5.30* |
| No. 5. Solid rock maple hanging  |       |



Kit 4M is for building this oil tanker

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## Foreign Clubs Granted Charters by National Guild

WITH the elimination of restrictions against foreign clubs, the National Homeworkshop Guild has become international in scope and is now ready to help home workshop clubs located in any part of the world. New regulations just established permit clubs outside the United States and Canada to be chartered as "foreign affiliates." These clubs receive a free charter, annual affiliate cards, and any special bulletins, but not the regular monthly bulletins and job sheets that are sent to the secretaries of all Guild clubs in the United States and Canada.

Two clubs have already taken advantage of this offer. The *Tientsin (China)* Homeworkshop Club has ten members. Thomas Pao-ho Liang, president, studied in the United States and at present is publisher of "The Advertiser," a monthly journal, and "The Evening Post," an evening daily. His hobby is model making.

The other club is the Canning Road Homeworkshop Club, *Wealdstone, Middlesex, England*, which was formed under the sponsorship of Harold James Blakeley and John A. Hammond. Mr. Blakeley, the president, is a member of the Science Fiction Association and the Junior Astronomical Association. The club recently made a trip through the London Science Museum.

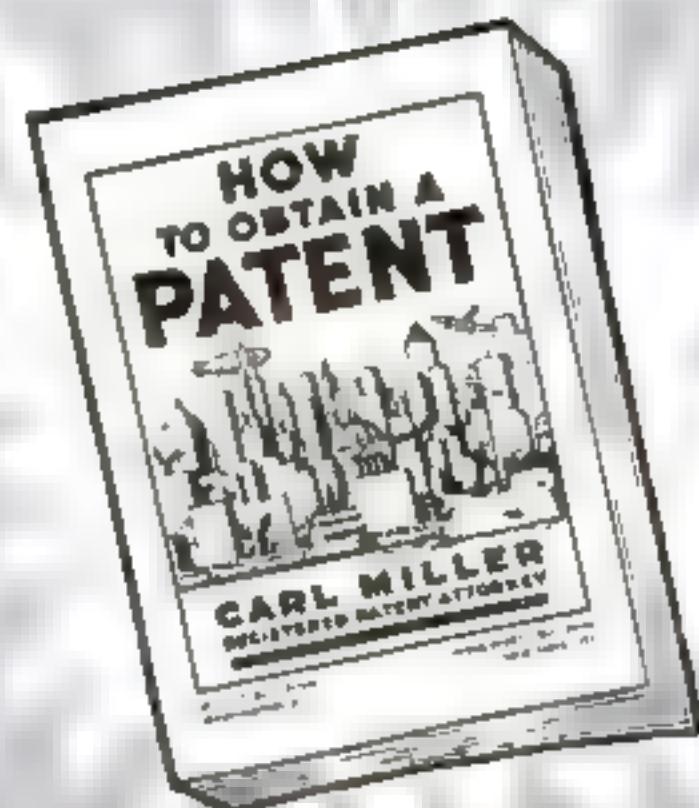
To the *Mandan (N. Dak.)* Handicraft Club goes the honor of being the first Guild club to organize a women's auxiliary. There are approximately twenty women and twenty-five men in the club. A workshop has been set up in the basement of a local bank building, and meetings are held weekly. The public is allowed to use the workshop on certain nights. Projects made by members were displayed at an open house recently.

Tony Giorlando and W. Knapp of the Merry Cottage Social and Hobby Club, *New York*, have completed a portable table for playing table tennis from plans published in *POPULAR SCIENCE MONTHLY*. Robert Mallet built a miniature ocean liner 4 ft. long, and Jack Grecco constructed a model airplane with a wing spread of 2 ft.

The Passaic County Homeworkshop Club, *Hawthorne, N. J.*, is completing plans for its first exhibition, which will be held in Paterson, January 28 to 30. The use of the metal and woodworking shops of Hawthorne High School has been obtained for club members.

New machinery recently added to the workshop of the *Ware (Mass.)* Homeworkshop Club include a jointer-planer, shaper, and drum sander. The equipment of the shop has so far cost over \$500. Julian Knapp, who is building his own home, has completed the cellar and is now busy constructing the first floor. Leopold Mozdzierz has built a gun cabinet. (Continued on page 32)

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## News of Guild Clubs

(Continued from page 31)

inet. Books on metal spinning and machine woodworking have been added to the club's library.

Officers of the Homeworkshop Club of *Independence, Mo.*, are Karl Miller, president; W. T. Doran, vice president; A. F. Baldwin, secretary; Earl Howe, treasurer; Rufus Wilson, librarian. Walter Davis, Harold Riggins, W. C. Smith, and the officers form the board of directors.

A prize is given each month by the Bison Homeworkshop Guild, *Buffalo, N. Y.*, for the best project. Theodore Roberts won the first of these prizes with a copper Colonial lantern. William Smith talked on wood overlays and exhibited a chest containing 20,640 pieces of wood. An appeal was made through



P. F. Hirsch, of Newcastle, Calif., won a prize with this float at the Placer County Fair. All sorts of odds and ends were pieced together to resemble a locomotive

the newspapers for old toys to be repaired and given to poor children.

The annual Christmas toy project kept the *Fairmont (W. Va.) Homecraft Club* busy for the past few months although some of the members found time to make period furniture . . . W. E. Fretz demonstrated uses of the carpenter's square for the *Oklahoma City (Okla.) Homeworkshop Club* and answered questions. The Guild's bulletins and plans have been bound in one volume in order to preserve them . . . The Timber Craft Homeworkshop Club, *New Bedford, Mass.*, has purchased a woodworking lathe and a small sander for its workshop and hopes to get a jig saw in the near future . . . The Cartier Homeworkshop Club, *Montreal, P.Q., Canada*, recently visited the Commercial High Students' Museum to inspect a display of local and foreign woods . . . Brunner A. Millard was host to the Capital Homecraft Club, *Washington, D.C.*, and demonstrated how to sharpen saws and jointers . . . Meetings of the recently organized *Niles (Calif.) Workshop Club* are being held in rotation at the homes of members. Moving pictures were shown at the home of Gladford Viery.

Although the *Billings (Mont.) Homeworkshop Club* was more or less demoralized by loss of machinery and

(Continued on page 33)

## News of Guild Clubs

(Continued from page 32)

supplies in last summer's flood, order is gradually being restored. Forty members and friends attended an outing at the ice caves in the Pryor Mountains.

By putting on an extensive membership campaign and obtaining the co-operation of the local newspaper, the Mark Twain Homocraft Club, Hannibal, Mo., was able to more than double its membership in a month. A recent meeting was held in a woodworking concern, and the superintendent demonstrated each type of machine and answered questions.

Fifty articles were displayed by members of the Society of Model Engineers, Ottawa, Ont., Canada, at an informal exhibit at the shop of Charles Ogilvie. A competition will be held in conjunction with an exhibition of the famous Titania's Palace made by Sir Neville Wilcox. A \$50 lathe will be awarded to the person having the best article in the show.

Rings carved from hard rubber and inlaid with bits of buttons were exhibited to the Mazda Homeworkshop Club, Euclid, Ohio . . . Paul Spunds has been named librarian of the Lafayette Homeworkshop Club, Jersey City, N. J. . . . The St. James Homeworkshop Club, Montreal, P.Q., Canada, co-operated with local charities in making and distributing toys at Christmas . . . A clam boil was enjoyed by the New Bedford (Mass.) Woodcraft Club at the summer home of E. F. Frawley. An exhibition will be held in February . . . Fifty members, wives, and friends attended "Ladies Night" of the Jacksonville (Fla.) Homeworkshop Club. Mr. Graham of the State Road Department talked on bows and arrows.

The Premier Homeworkshop Club, Chicago, Ill., discussed plans for its annual exhibition at its headquarters in the River Park Fieldhouse recently. Henry Wagner, secretary, is visiting the members' shops to photograph them for the Guild's records . . . Officers of the Westwood Homeworkshop Club, Lynbrook, N. Y., are John Gorham, president; Herbert White, vice president; Reginald Crotty, secretary-treasurer; Ernest Mazzara, librarian.

A questionnaire on the meaning of shop terms and use of tools created a lot of fun for the Louisville (Ky.) Homeworkshop Club. Recent meetings have been devoted to the annual toy project . . . A goal of 150 members has been set by the Seattle (Wash.) Homeworkshop Club. A drill press will be awarded for the best project made in a home workshop during the winter months. Officers are T. O. Gillebo, president; C. J. Lowe, vice president; F. N. Mallett, librarian; Talbot McGar, secretary-treasurer; J. C. Kiger, corresponding secretary . . . The Walla Walla (Wash.) Homeworkshop Club held its fall exhibit in December . . . C. J. Watson, a manual training instructor, demonstrated woodturning to the Saginaw (Mich.) Homocraft Club.

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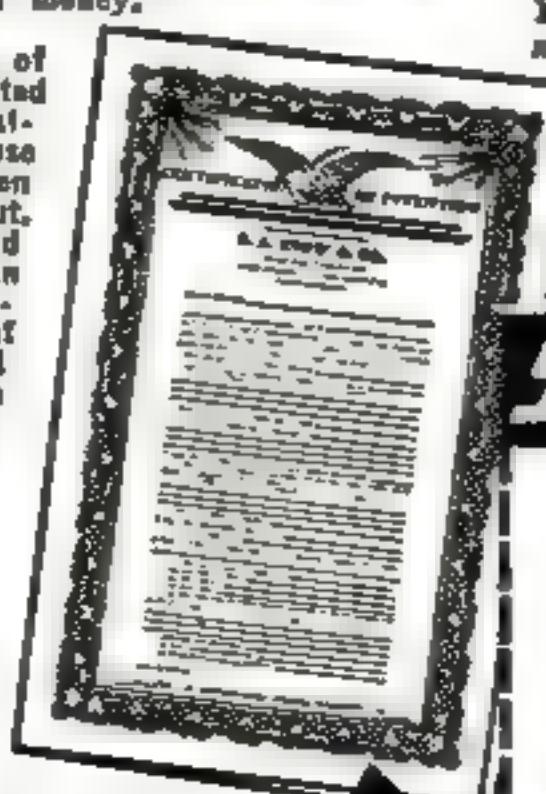
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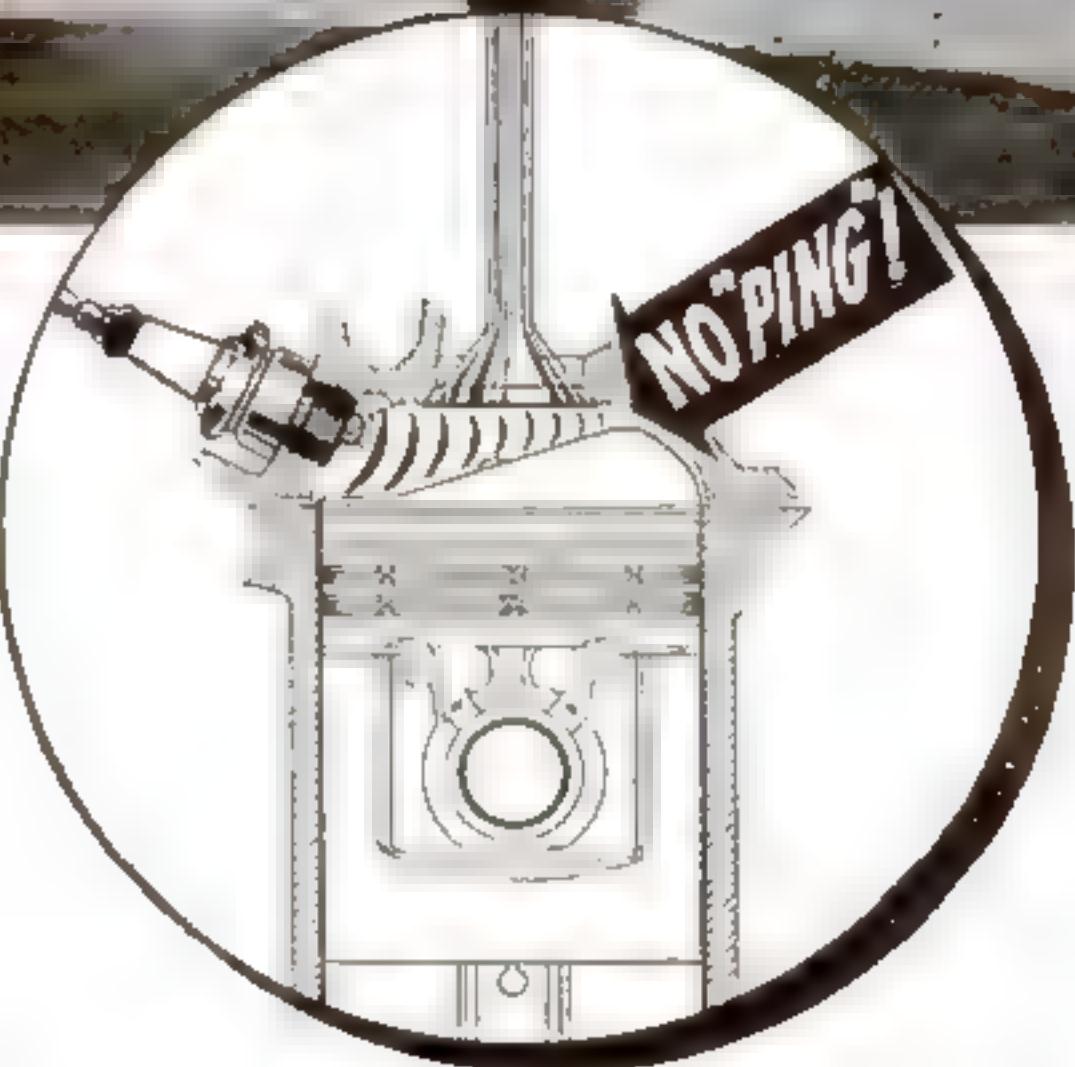
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# How Monkeys AID IN WAR ON Infantile Paralysis



A group of monkeys used in experiments at Stanford University. Each is numbered for recording purposes



This simian subject is being given a treatment designed to give immunity from poliomyelitis. He will be exposed to the virus to test its effectiveness

By  
**ANDREW R. BOONE**

**S**TRIKING without warning, poliomyelitis, or infantile paralysis, one of the most baffling diseases known to medical science, spreads suffering and death. With the coming of warm weather, it may appear anywhere, from New York to California, New Orleans to Seattle.

Children, more than grown-ups, develop fever, become restless, succumb to paralysis. Two thousand stricken adults and children crowded one western hospital not long ago. One resident physician in ten treating the cases died. No known medicine can arrest the disease once it attacks.

Polio fighters today pin their faith on preventives, rather than cures. In a score of laboratories, from one side of the continent to the other, scientists are busy this winter perfecting means which they hope will halt any epidemics that may strike at the nation next summer.

Already, through years of research, they have learned these significant facts:

Infantile paralysis is caused by a virus twenty-five times as small as the tiniest entity that can be seen through the strongest microscope.

The disease occurs only in man and monkey, entering the central nervous system by way

#### PUT TO SLEEP

A research worker has just anesthetized this monkey with ether to make it easier to handle during the tests. The animal rests in a specially constructed box



Below, Dr. E. W. Schultz of Stanford University is grinding pieces of spinal cord from infected monkeys in a mortar to prepare new virus that will be employed in further experiments



of the exposed olfactory nerves in the nasal passages.

From the olfactory nerves, the virus travels to the motor centers in the medulla and spinal cord, within and not along the outside of the nerve cells.

Remember these findings, for they are the keys to the recent discovery that simple chemicals, when expertly applied by trained research workers, render monkeys completely immune to the dread disease. The chemicals work on monkeys—but will they be equally effective when applied to adults and children?

Behind the apparently simple discovery by Dr. E. W. Schultz and L. P. Gebhardt at Stanford University, Calif., that zinc sulphate blocks the delicate nerve endings so the polio virus cannot enter, is a dramatic story of scientific warfare along many fronts—a warfare which now has become hopeful for the first time.

Two years ago, expert prophylactic teams spread through Alabama, Mississippi, and Tennessee, under command of Dr. Charles Armstrong, senior

surgeon of the U. S. Public Health Service's National Institute of Health, administering picric acid-alum sprays to 2,000,000 people. One third fewer persons fell with polio than would have been expected, judging from the unsprayed group. But this partial success was not enough, and Dr. Armstrong carried this question back to the laboratory workers:

Why were some saved and not others?

Dr. Max Minor Peet, University of Michigan neurosurgeon, investigated the question and soon discovered that through inadequate spraying the victims may not have had all the exposed nerve tips coated with the solution. Aided by Dr. Harry J. Richter and Dean H. Eckols, Dr. Peet then proceeded to seek some mechanical means of delivering the spray materials to the nerves, so that not even a trace of virus could reach them.

Meanwhile, the fight continued. It was in California, again at Stanford University, that Dr. Schultz and his as-

sociates, testing forty chemicals, found zinc sulphate more effective than any others—including picric acid and alum, which had proved partially successful.

Meanwhile, also, microbe hunters at other institutions, private and public, were seeking answers to the many new problems which this strange disease presents.

But let's flash back a few years to get at the beginning of the modern attack on one of the strangest diseases known to mankind.

Nearly three decades ago, studies in Europe and America showed that the virus could be transmitted to monkeys, and that it might be "ultramicroscopic," or far beyond the range of the most powerful microscope. These discoveries gave impetus to the search for a preventive, for they pointed a way to experiment without danger to humans, and gave bacteriologists and pathologists a better understanding of the disease-carrying medium with which they were working.

Only in the last decade have research workers made sensational progress in getting at the secrets of the virus. Dr. Schultz definitely fixed the virus as ultramicroscopic. Other researchers at the Rockefeller Institute in New York City and the National Institute for Medical Research in London, England, by comparing its rate of flow with that of water and other substances of known filter-passing rates through collodion membranes, placed the size—on the order of 2,500,000 to the inch.

As Dr. Schultz, Dr. Claus Jungeblut at Columbia University in New York City, Dr. P. K. Olitsky at the Rockefeller Institute, and others proceeded toward a common goal, serums, vaccines, and chemicals were flung at the enemy in a mass effort to achieve a victory.

THEY learned not only that they were dealing with parasites which attacked nerve cells from within, but also that these could not be grown and studied except in the presence of live cells. This complicated their problem enormously, for they could not observe the material growing in test tubes and in

**Every summer, infantile paralysis takes its toll among men and women as well as children. For years, the dread illness has spread uncontrolled, leaving behind thousands of crippled victims. Today, medical experts are experimenting to find a sure-fire preventive. Novel tests on monkeys, described on these pages, may point the way to the final conquest of this scourge**

the conventional culture mediums.

For several years serums gave promise. Vaccines offered some hope.

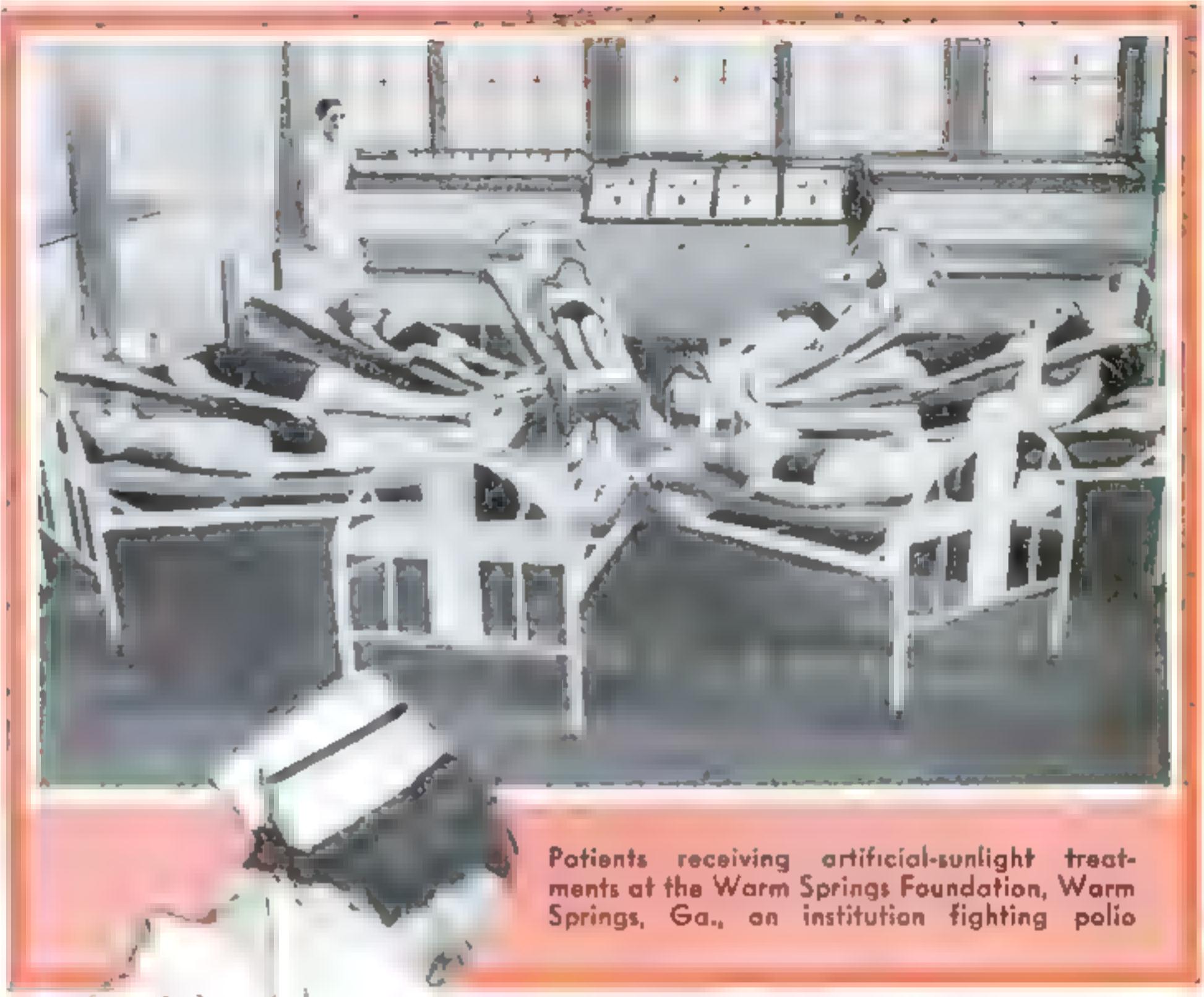
In New York, Dr. William Park and Dr. Maurice Brodie developed a vaccine from the spine of a monkey which had been inoculated with the virus. With this vaccine, they inoculated not only themselves but also twenty-five children, hoping it would set up in their blood antibodies capable of beating back the disease.

During an epidemic at Los Angeles, Dr. John F. Kessel, University of Southern California bacteriologist, prepared serum from those stricken and administered it to 150 monkeys, without appreciable positive results.

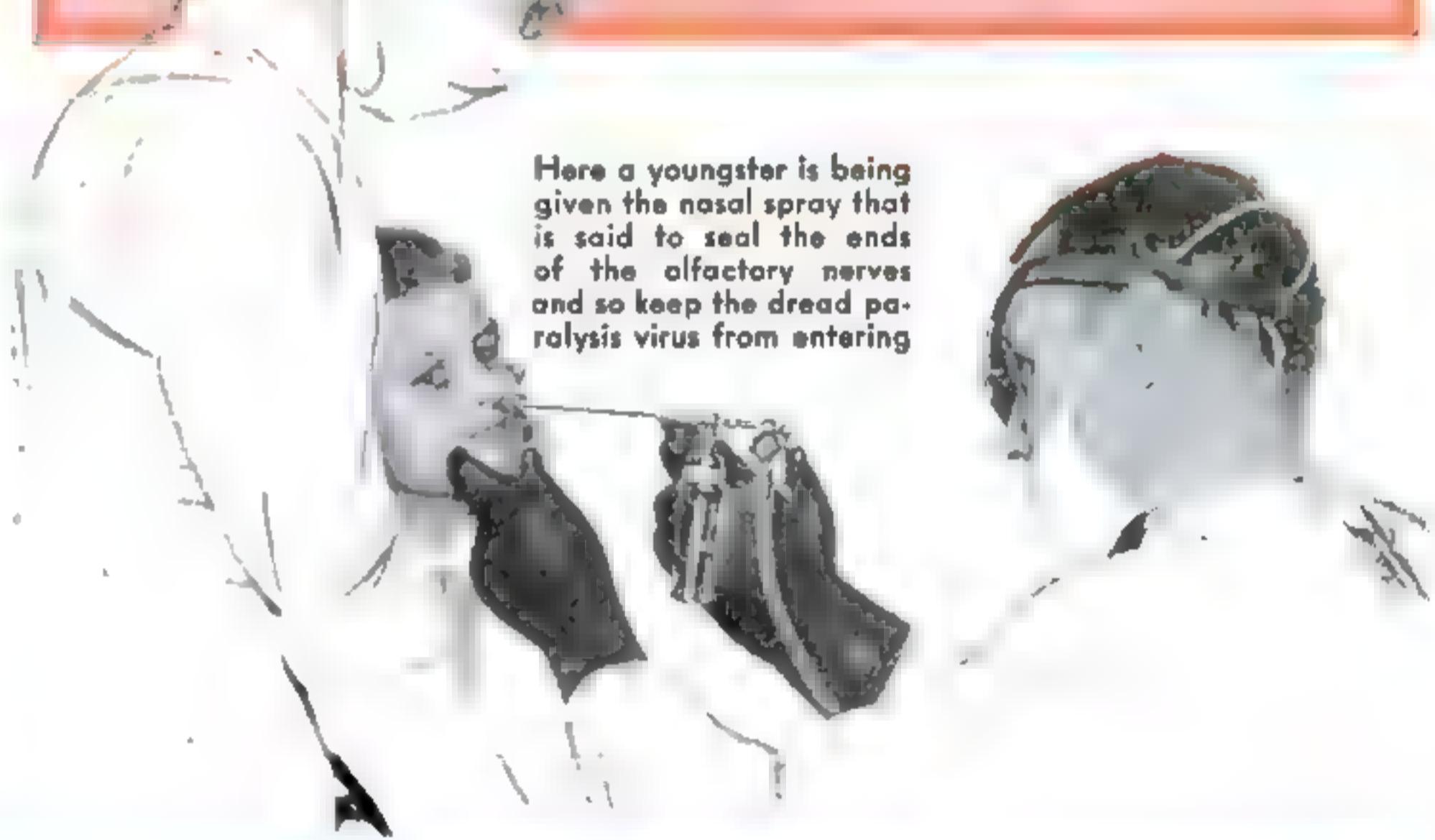
**A**T TEMPLE UNIVERSITY, Dr. John A. Kolmer developed another kind of vaccine, said to have conferred immunity on twelve of twenty-five children within four days. Dr. Kolmer and his laboratory assistant, Anna M. Rule, tried it on themselves, after which John and Daniel Kolmer, the doctor's only children, were vaccinated. Later, blood tests showed the presence of antibodies, which were supposed to combine with the disease "germs" and render them impotent.

During the last half year, Dr. Edwin H. Lennette at the University of Chicago has been seeking to unravel the mystery of the so-called blood-brain barrier. His results thus far indicate that crystalloids, such as sodium bromide, and colloids, such as horse serums, pass from the blood into the spinal fluid more readily during an attack of polio in monkeys than in normal animals. While this has some bearing on the use of serums, only more research will determine what methods will be useful. Dr. Lennette has not abandoned vaccines, and is just now beginning experiments with this method of attack.

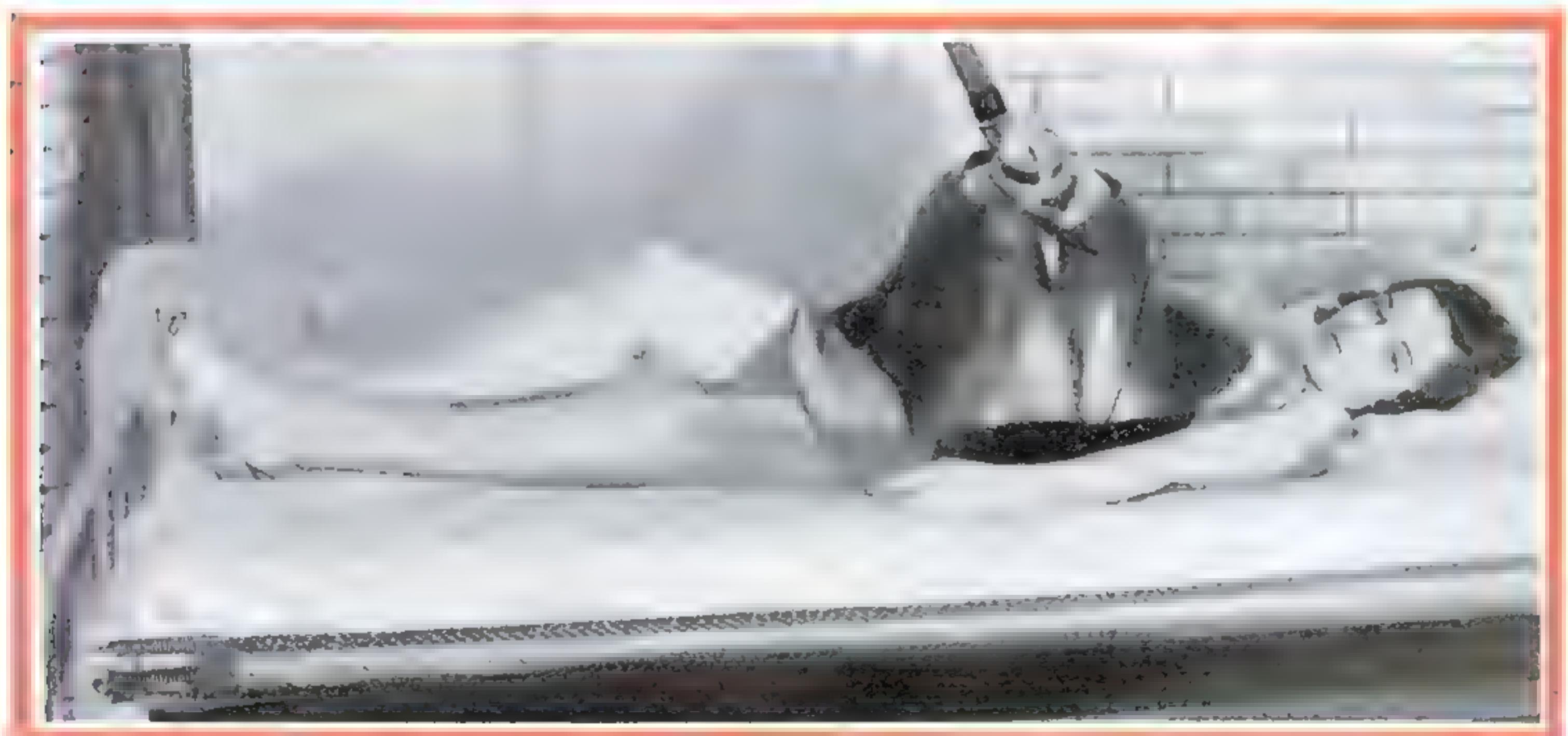
Again, at Columbia University, Drs. Jungeblut and Earl T. Engle, by injecting extracts (*Continued on page 118*)



Patients receiving artificial-sunlight treatments at the Warm Springs Foundation, Warm Springs, Ga., an institution fighting polio



Here a youngster is being given the nasal spray that is said to seal the ends of the olfactory nerves and so keep the dread paralysis virus from entering

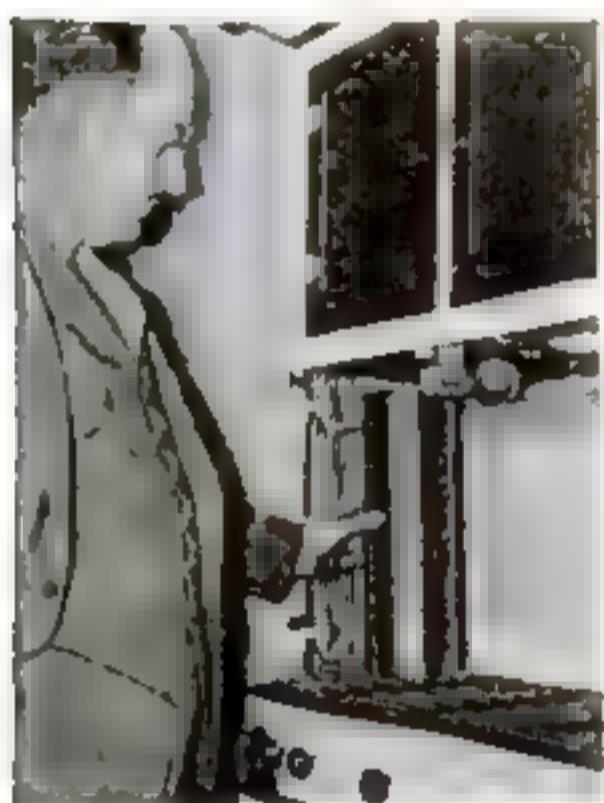


Replacing the famous "iron lung" in the care of infantile-paralysis sufferers, this rubber respirator alternately applies vacuum and light pressure to the patient's chest walls to stimulate breathing, doing the work of chest muscles made useless by the disease

# New Comforts



The wide, semicircular door of this home on wheels makes it easy to carry furniture in or out. Fitted with a screen, it converts the front end of the trailer into an airy porch



Hot water is provided by a three-gallon water tank that swings out over a burner of the gasoline range as shown in the photograph at the left. When not in use, it disappears into the cabinet



Complete U turns can be made on narrow roads when a trailer is fitted with this hitch. A third trailer wheel is steered by rods connected to the rear of the car



Instead of a trailer, a novel car has an "upstairs" bedroom that is made available by raising the top. It is seen on the road at left, and below with the top up for the night



Outboard motors, sporting equipment, luggage, and other articles are carried conveniently in a dust-insulated compartment reached by outside doors

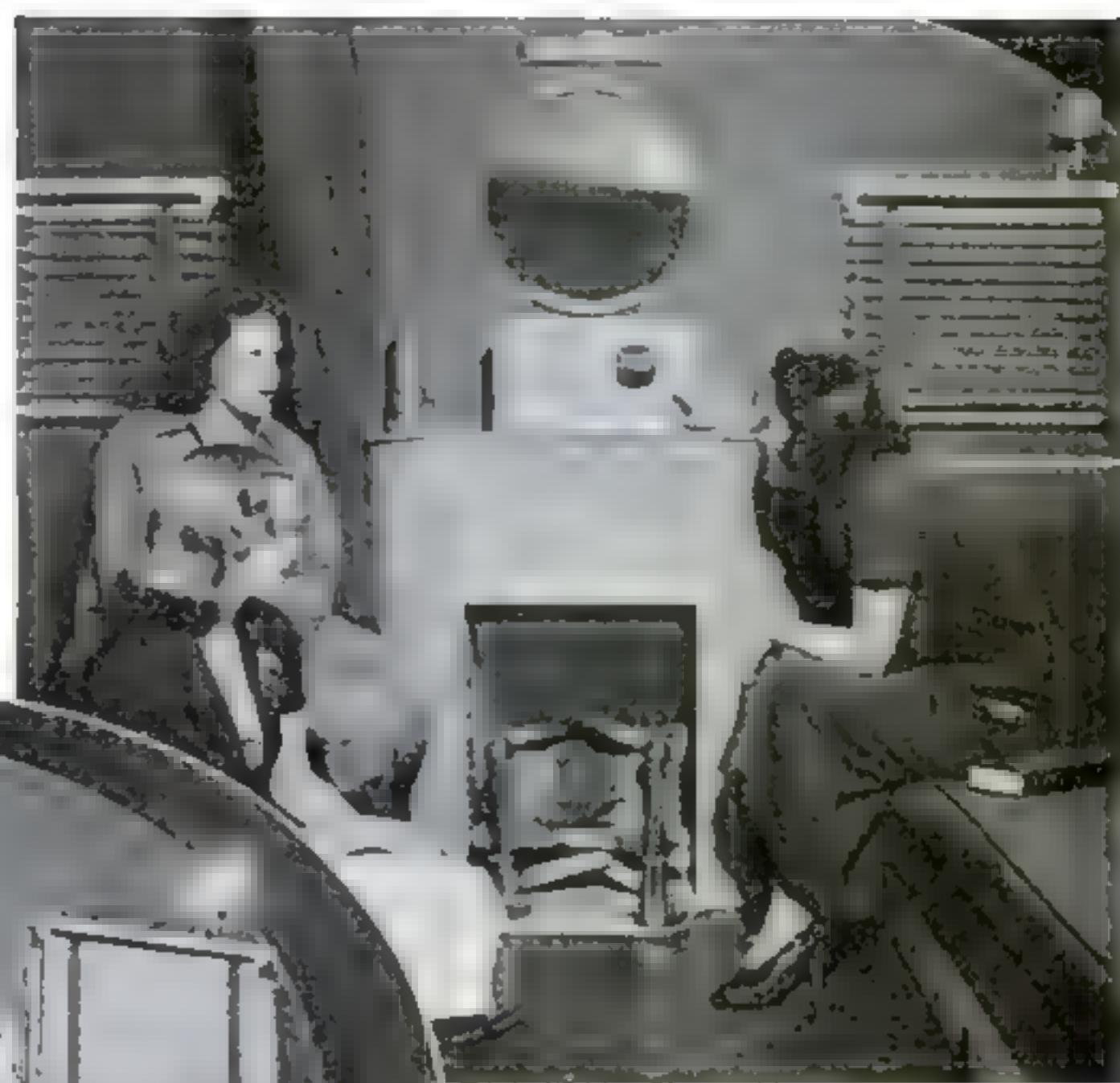
# for Trailer Travel

can easily level the floor of a trailer parked on uneven ground. So flexible is another improved hitch that car and trailer can even face in opposite directions. Novelties include a trailer body that half envelops the car itself, and a car that unfolds vertically into a two-story home.

One maker, who markets a complete "mobile cottage," views it as the forerunner of sectional homes. Home owners of the future, he predicts, will be able to purchase a dining room, a bedroom, a kitchen, or a living room, all mounted on wheels. From these sectional units, they will be able to assemble a complete home, in an H or C-shaped pattern, with interconnecting doors permitting passage from room to room. Metropolitan centers may be ringed with trailer cities of such homes, he suggests.

With a new jack attached to the hitch, even a woman can easily level the floor of a trailer that has been parked on uneven ground

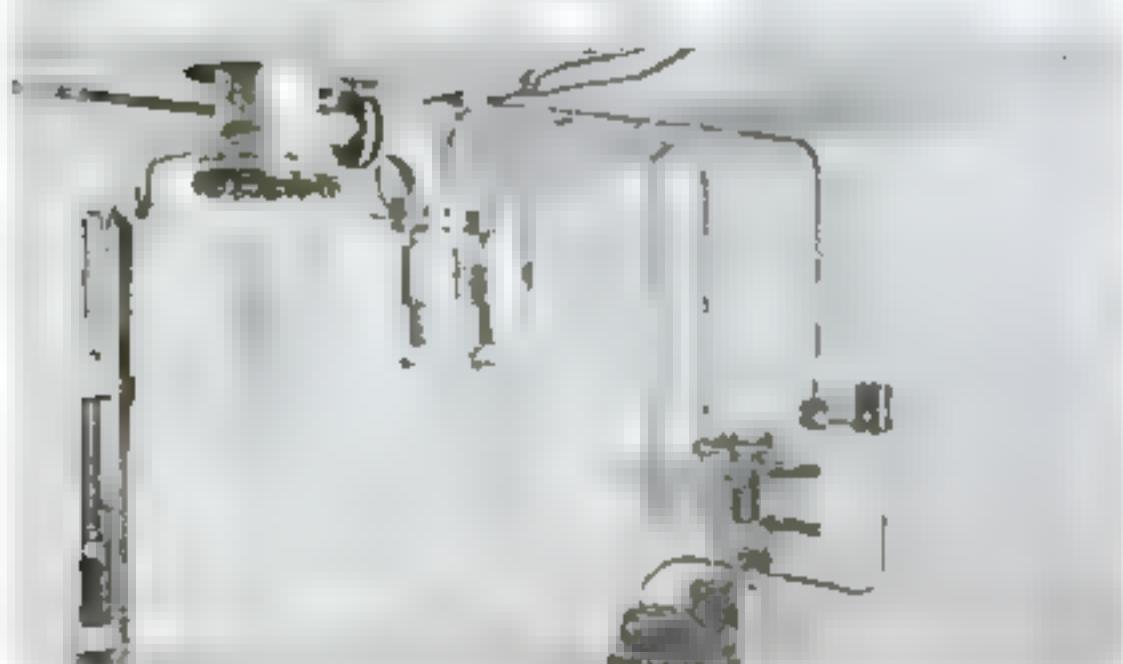
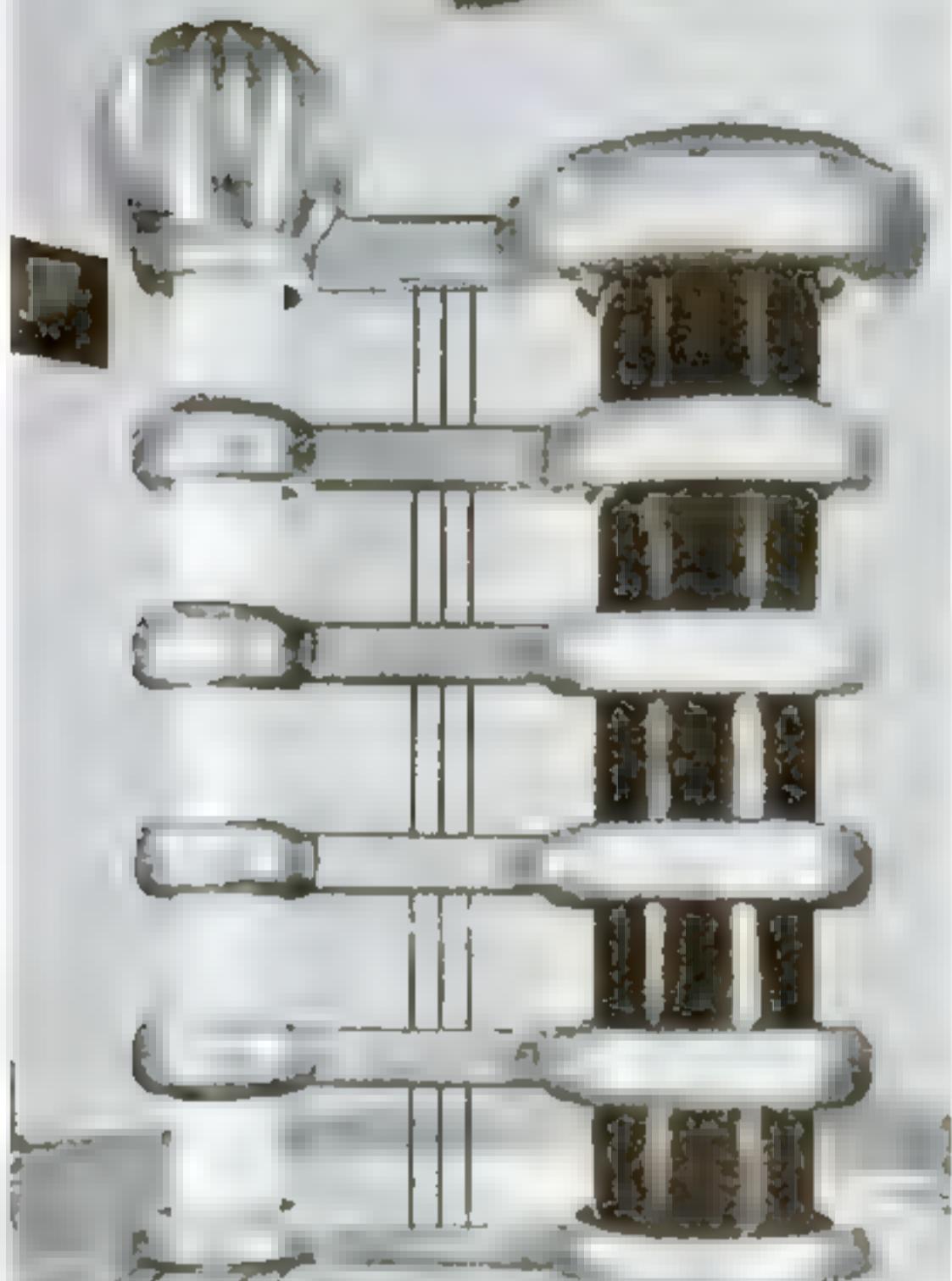
Housing a gas or electric heater by day, a fireplace adds a homely touch to one of the new trailers. At night, the fireplace is swung outward and becomes the dresser seen in the illustration below. It is fitted with drawers, racks, and compartments



Trailer cottages like these, designed to meet the housing shortage, are really semipermanent homes. The one above has steps and a skirting to cover the wheels



# World's Largest X-Ray Tube Is Three Stories High



This composite picture shows the full length of the thirty-foot tube extending through two floor levels



Patient under treatment at one of the four outlet ports of the tube. Motor-operated shields control the flow of the rays

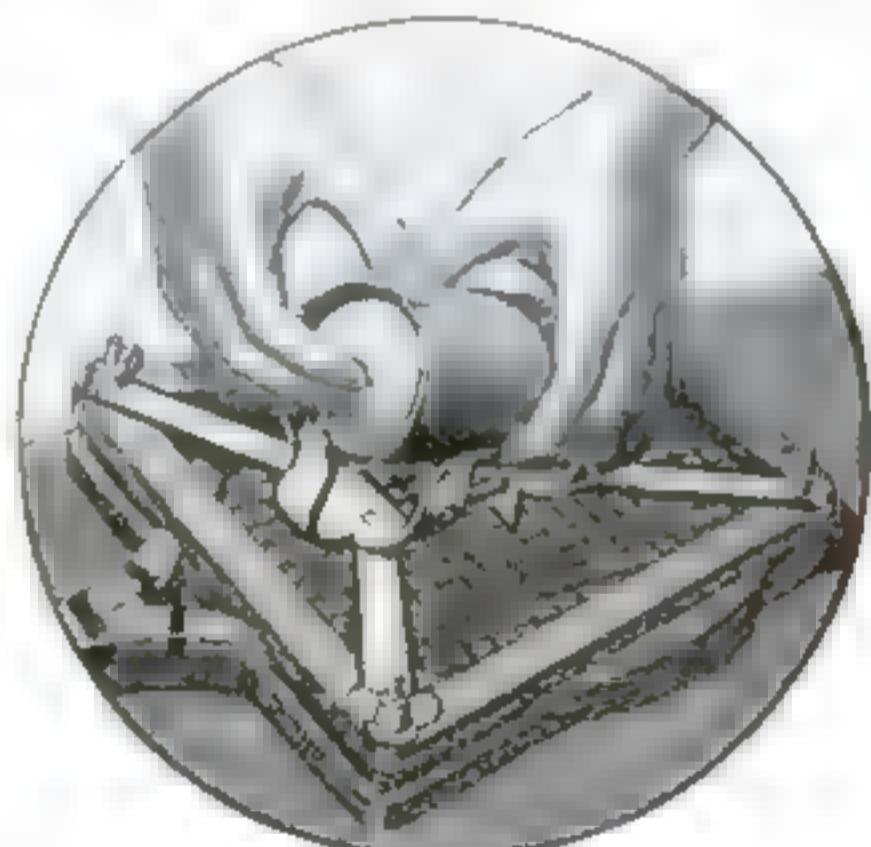


Below, patient and nurse seen through a periscope from a master switchboard on the floor above

DESIGNED for treating cancer patients with ultra-short X rays developed by 1,600,000 volts of electricity, the world's largest X-ray machine has just been completed in a specially constructed building at the Los Angeles Institute of Radiology in California. Generating more radioactive energy than the entire world supply of radium, the giant apparatus is thirty feet tall and extends through two floors into three stories of the structure. Radiating from a filament not much larger than a peanut, housed in the aluminum cap of the mammoth tube, electrons bombard a gold target at the base of the tube to produce X rays which are deflected into outlet ports that permit treatment of four persons simultaneously. Skilled technicians controlling the tube from a master switchboard observe treatment of the patients by means of a periscope.

## Clamp on Racket Press Holds Tennis Balls

A HOLDER for tennis-ball containers, just invented by Albert W. Stein, of Hillside, N. J., makes it possible to carry a tennis racket, press, and balls as one unit. Holding the regular tin container, in which tennis balls are usually sold, by a group of spring fingers, the device has four metal arms that are attached to the racket press by means of the screws and bolts of the press itself, as shown in the drawing at the right.



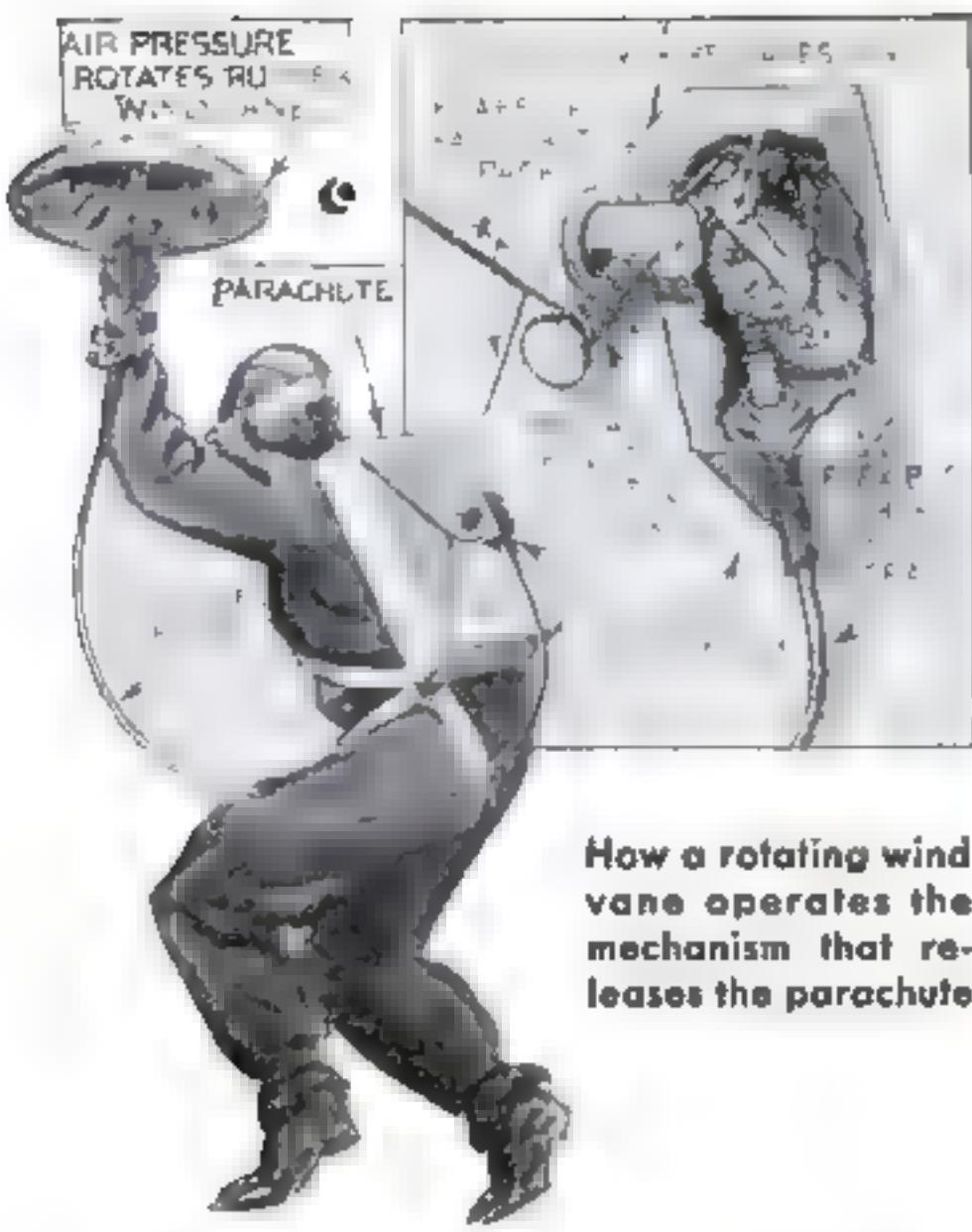
Spring clips grip container for balls



Flash light clamped to snow shovel for use at night

## Flash Light Fits on Shovel Handle

FITTED with a special attachment clamp, a weatherproof flash light recently placed on the market fastens to the handle of a snow shovel or snow scoop to facilitate the clearing of unlighted sidewalks or driveways at night. Shown in use at the left, the unit can also be attached to a coal shovel to make it easier to scoop up coal from a dark bin.



## Automatic Parachute Releases Itself

INTENDED for use by plane passengers and inexperienced pilots, a parachute designed by Henry A. Burgess of Los Angeles, Calif., opens automatically at a safe interval after the wearer has jumped from a plane. Held by the jumper, a rubber wind vane is revolved by air pressure and drives a flexible shaft. The latter operates a gear mechanism mounted on the parachute pack to open the flaps after a predetermined interval.

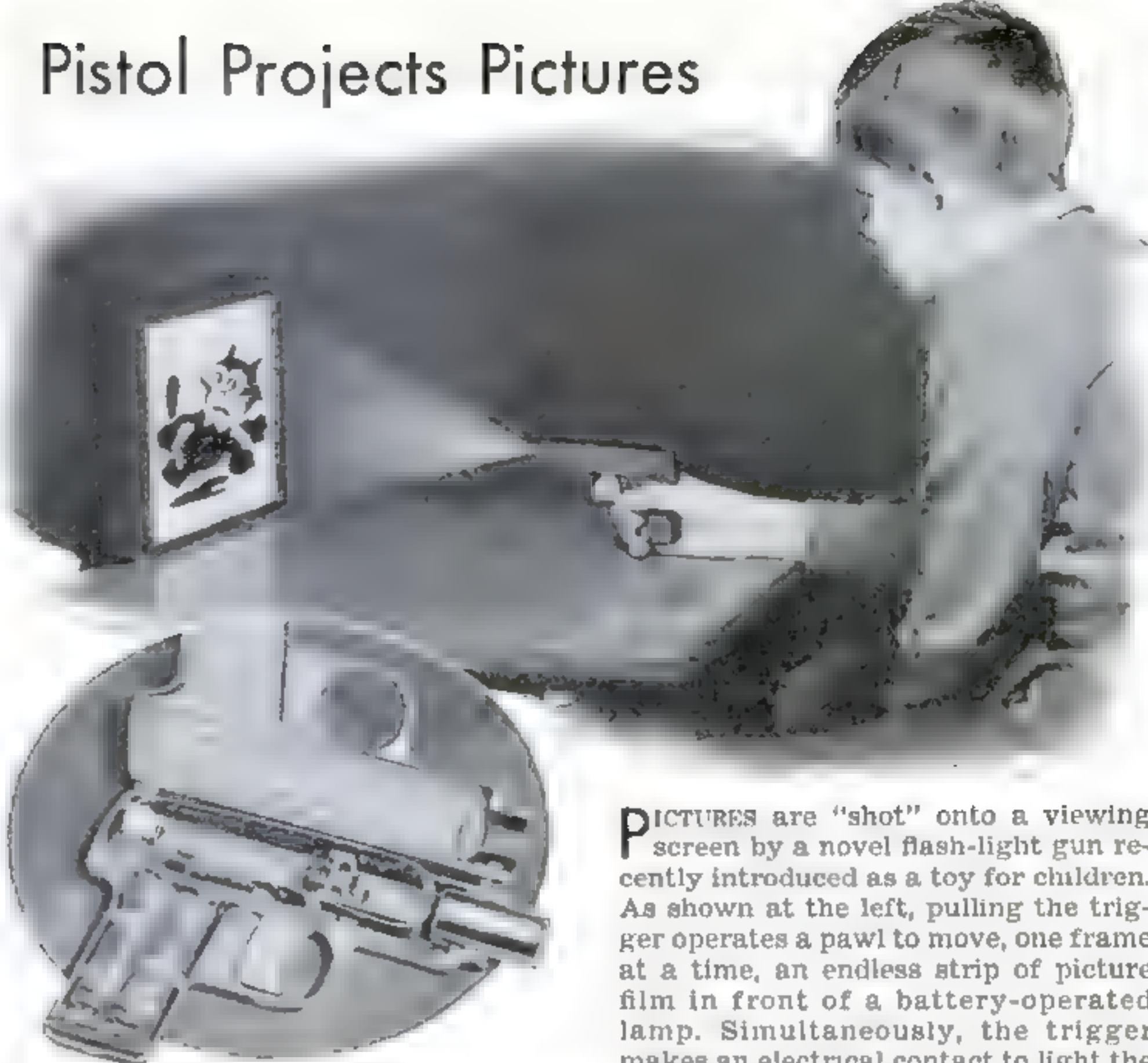
## Earrings Aid Identification

METAL earrings are now being worn by English fishermen for identification in case of accident or death at sea. The metal pendants are stamped with the names and addresses of the wearers.



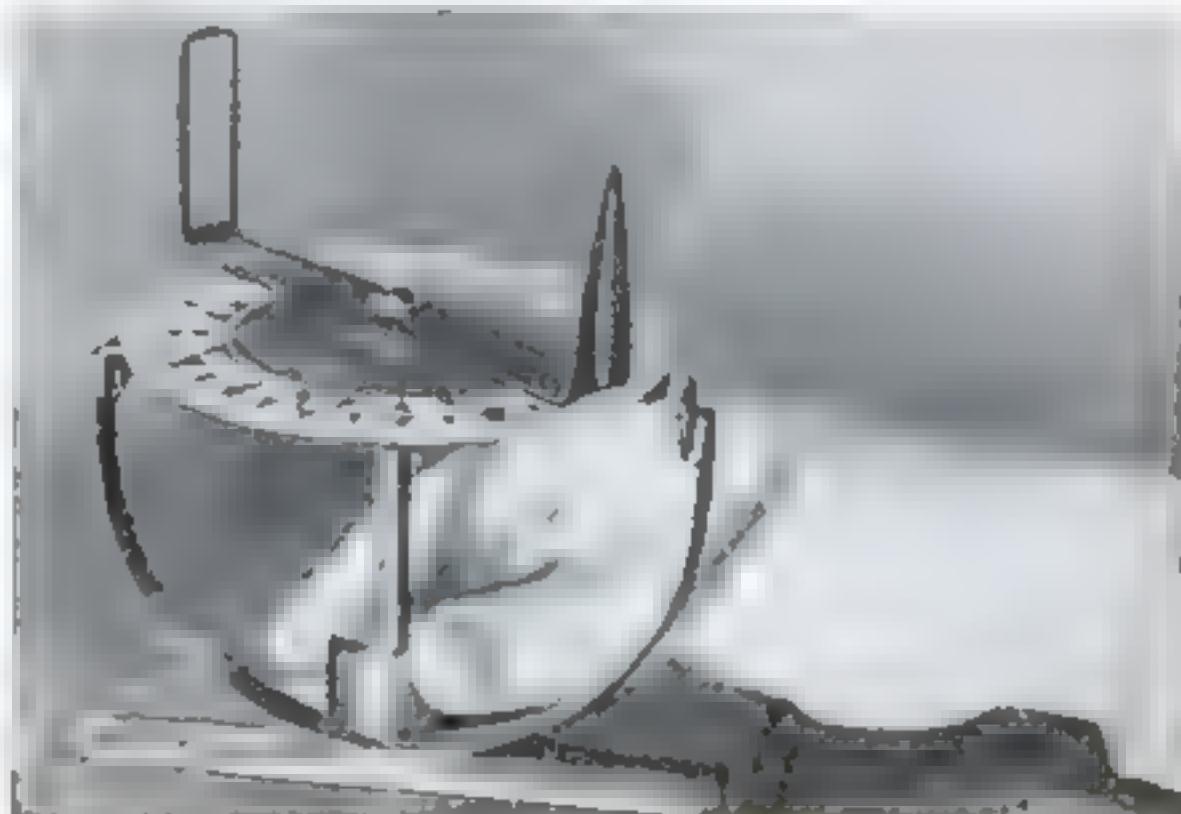
Earring is stamped with wearer's name

## Pistol Projects Pictures



## Navigation Fans Get Low-Priced Pelorus

A COMPANION instrument to a low-priced sextant recently placed on the market (P.S.M., July '37, p. 52) is an inexpensive pelorus now available. Designed especially for amateur navigators and boat owners, the instrument has two sight vanes, permitting the user to take accurate bearings on landmarks, buoys, and other ships. The unit is well constructed of heavy brass.



This instrument helps small-boat owners get bearings

## Police "Lasso" Bandit Cars with Grapnels on Bumpers

CLAMPED securely to the front bumper of a police automobile, a new device recently tested in Portland, Ore., is designed to bring the cars of fleeing motor-

ists safely to a halt. An automatic hook snaps over the rear bumper of the pursued car as police overtake it on the road. The police car then applies its

brakes and wire cable is paid out by a spring-operated reel that forms a part of the unit, to drag the fleeing automobile to a stop.



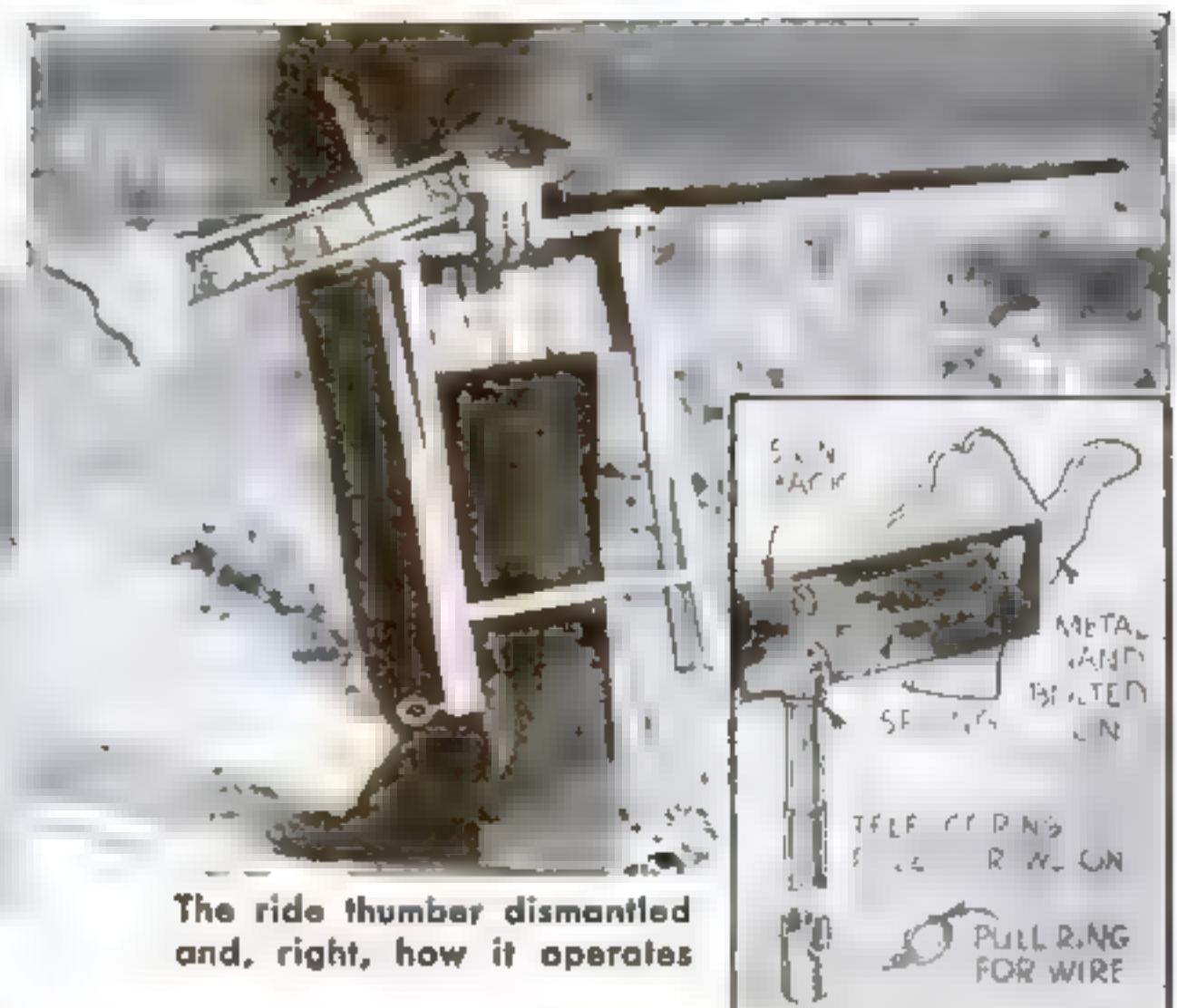
Demonstration of a new police-car attachment that grapples fleeing cars and drags them to a stop. The photograph at the right shows the grapnel engaging the rear bumper of the quarry



# Mechanical Ride Thumber Speeds Hitch-Hikers Across Country

Two young travelers with the odd device they used in hailing passing automobiles

SAN FRANCISCO



CREDIT for their crossing of the continent in twenty-seven days is given by two Maine college students to the odd mechanical thumber which they used to hitch auto rides. A wooden hand with thumb extended is pivoted to a metal destination sign supported by a hollow pole. Pulling a wire operates a spring to jerk the hand in the approved hitch-hiker's gesture.

## Audience Sees Pianist's Hands in Mirror



Pianist playing before tilted mirror that reflects image of keyboard

TO ENABLE the entire audience at a piano recital to see the player's hands, Dr. Thomas C. Poulter, of Chicago, Ill., conceived the idea of tilting a large mirror beside the instrument as shown at the left. Because the piano is placed sidewise on the platform, ordinarily only half the listeners have a view of the keyboard. Dr. Poulter's plan makes it possible for the other half to watch the movements of the hands in the mirror.



## Find Plane Food Needs Special Cooking

TO DETERMINE the effects of high altitudes and the accompanying decrease in atmospheric pressure on the cooking of meals aboard transport planes, engineers at a California air base have conducted a series of cooking tests. One experiment, pictured above, proved that a "three-minute egg" requires three and a half minutes at 5,000 feet, and four and a half minutes at 12,000 feet.



This dog is being fitted with a set of artificial teeth

## Old Dog Gets False Teeth

BELIEVED to be one of the first of its kind ever fashioned, a canine dental plate was recently made and fitted to an old Boston terrier belonging to Mrs. George Earl, of Aberdeen, Wash. In the photograph at the right, a dentist and his assistant are shown fitting the set of false teeth to the aged pet, which now, it is said, is able to chew effectively, and seems perfectly satisfied with his new dental equipment.

## Control for Machine Guns

BY MEANS of a new remote-control mechanism, batteries of machine guns scattered over a wide area can be controlled by one gunner operating a master trigger. The guns can be fired singly or simultaneously.

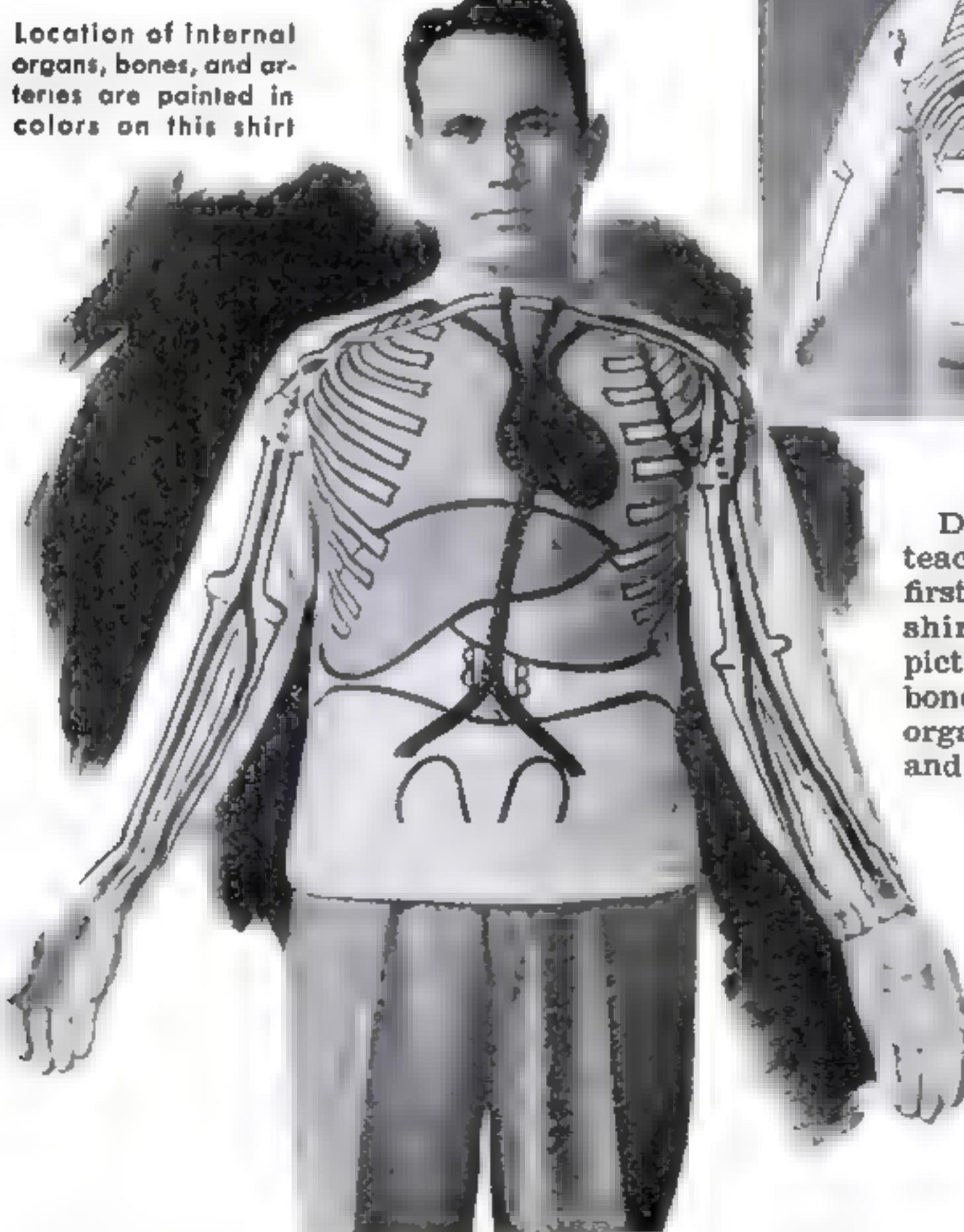
## Magic Electric Wand Tells Sex of Eggs

LAID OUT in rows on a wired table, as shown in the photograph below, eggs are touched with the electrode of a new electrical machine to determine whether they will hatch out as cockerels or as pullets. Invented by Dr. W. P. Funk at his Temple City, Calif., poultry ranch, the unique apparatus sounds a signal to indicate the sex of each egg.



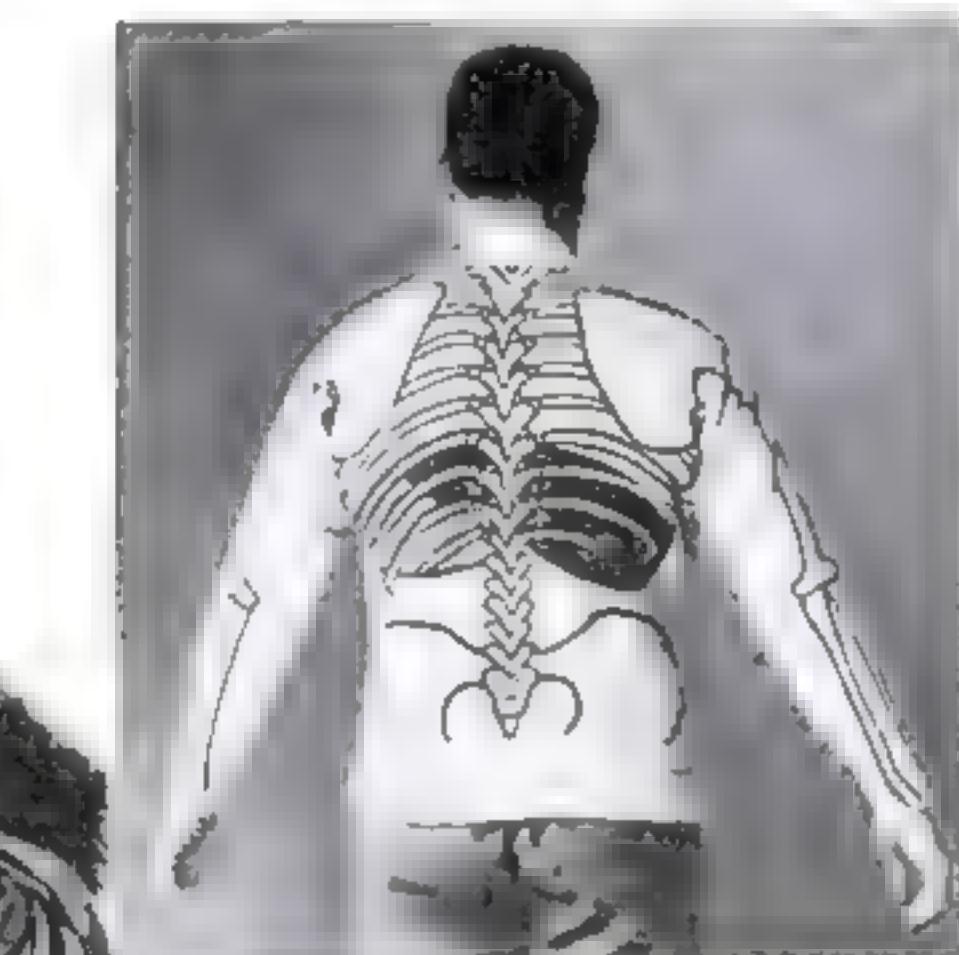
Eggs on wired table for electric sex test

## Shirt Is Chart For Teaching First Aid



Location of internal organs, bones, and arteries are painted in colors on this shirt

DESIGNED to help in teaching the principles of first aid, a novel anatomical shirt presents a graphic picture of the location of bones, arteries, and internal organs in the human arms and torso. Details of internal parts are printed in black outline and contrasting colors on front and back of the fitted sweat shirt. When worn by a model, the garment serves as a three-dimensional anatomical chart for use in practical first-aid lectures and for demonstrations.



One of the pictures made with the crude camera shown below



## Photographer Uses Packing-Box Camera

TO DEMONSTRATE that expensive equipment and fast lenses are not absolutely necessary for certain types of photography, William H. Townend, a New York City camera enthusiast, made a remarkable series of "still" shots with a pin-

hole-lens camera made from a cardboard packing box. Protected from light leaks by a black paper lining, the cardboard camera was provided with a hinged back for inserting the film. A stop watch was used to time the exposures.

## Mount for Spare Wheel Makes Changing Easy

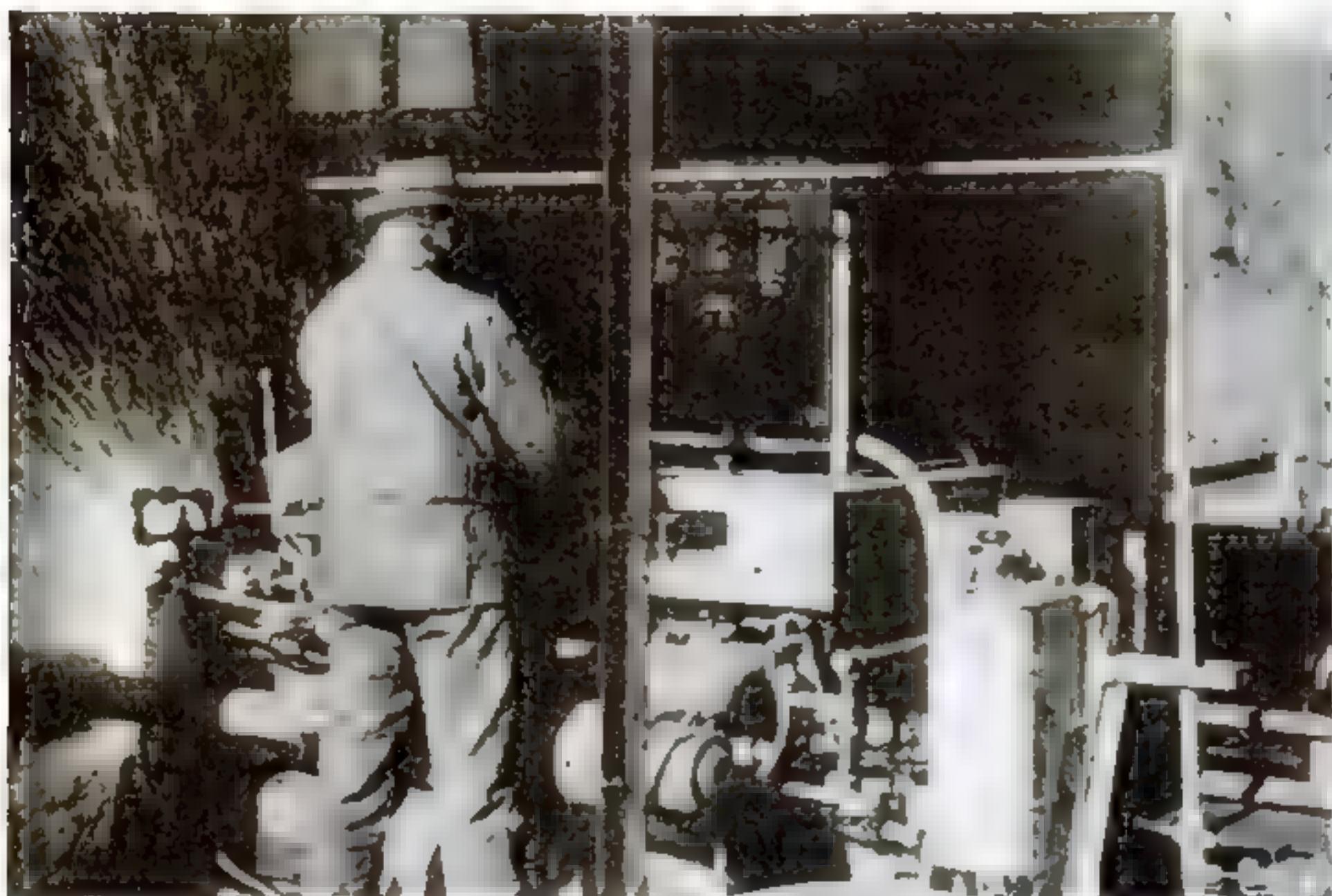
CHANGING tires on automobiles is made easier with the novel wheel mount pictured below. The spare wheel is held in the luggage compartment in a special hinged frame. When the frame handle is pulled gently, the wheel moves out of the compartment and is lowered easily to the ground. The process is reversed in storing away the wheel with the flat or blown-out shoe that has been removed from the axle.



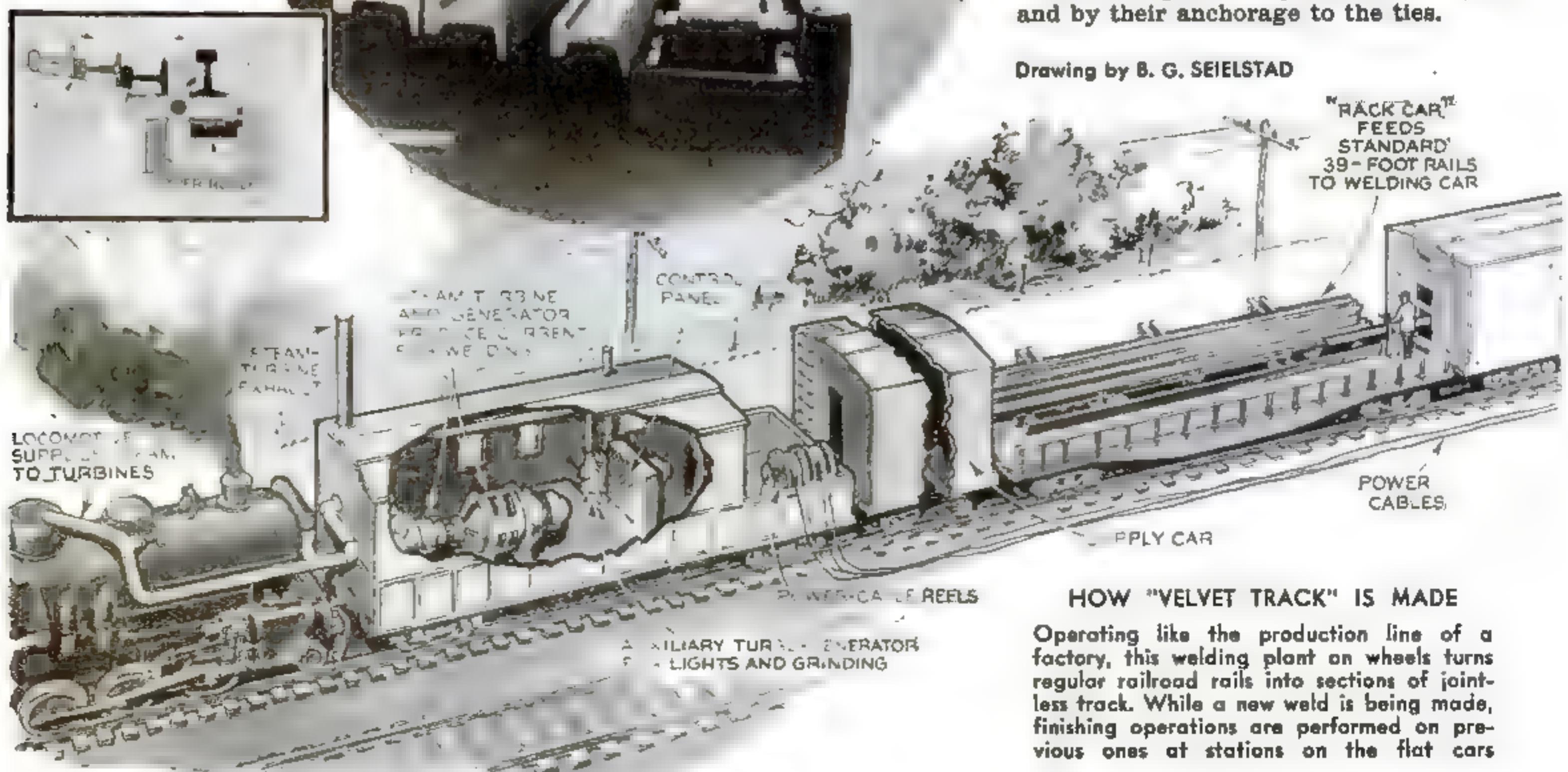
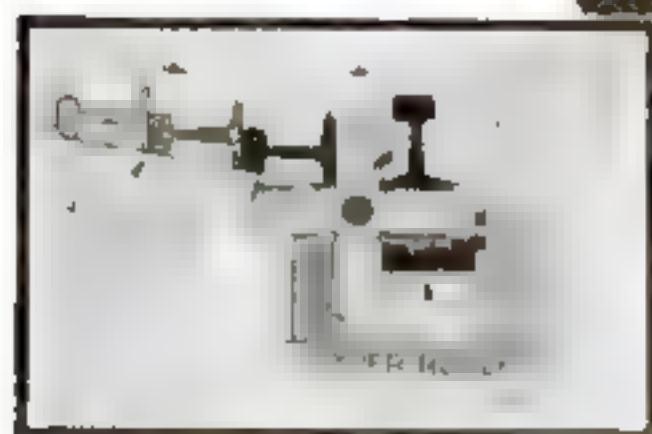
When the handle is pulled, the spare wheel swings to the ground as in the lower view

# One-Piece Railroads

LAID BY MOBILE WELDING PLANT



Interior of the welding car, showing the machine that joins rails together into lengths up to 1,500 feet. At the right, standard thirty-nine-foot rails are seen on the rack from which they are lifted onto rollers by the device below and fed into the welder.



**J**OINTLESS railroad track, banishing the clickety-clack that jangles the nerves of train passengers, has proved a success in its first trial in America. Following pioneer experiments with continuous rails up to a mile or more in length (P.S.M., Apr. '37, p. 53), one railroad, the Delaware & Hudson, used them exclusively for all the track it laid last year. Not only do the new rails give passengers a "velvet ride," the trial has shown, but they also virtually eliminate the battering of rail joints that requires constant inspection and frequent replacement of track and rolling stock. To meet the increasing demand for them, Sperry Rail Service engineers have now placed in operation a special welding train that turns out the long rails by mass-production methods. How standard thirty-nine-foot rails are arc-welded into lengths of as much as 1,500 feet aboard this train is shown in the accompanying illustrations. As the final step, any desired number of these sections are fused together with thermit or chemical welds during the operation of laying them.

Rails made by the new process appear to defy the laws of physics. Though a steel rail seems the ultimate in rigidity, a train of flat cars bearing the long rails to their destination snakes them around the sharpest turns without difficulty, the rails bending to take the curve as if they were made of rubber. Once they are laid, experiments with a 6,700-foot rail have shown, they cease to expand or contract with changes in temperature as other steel objects do. Instead of shrinking in length as the thermometer drops, they are easily held in a "stretched" position by their welded joints and by their anchorage to the ties.

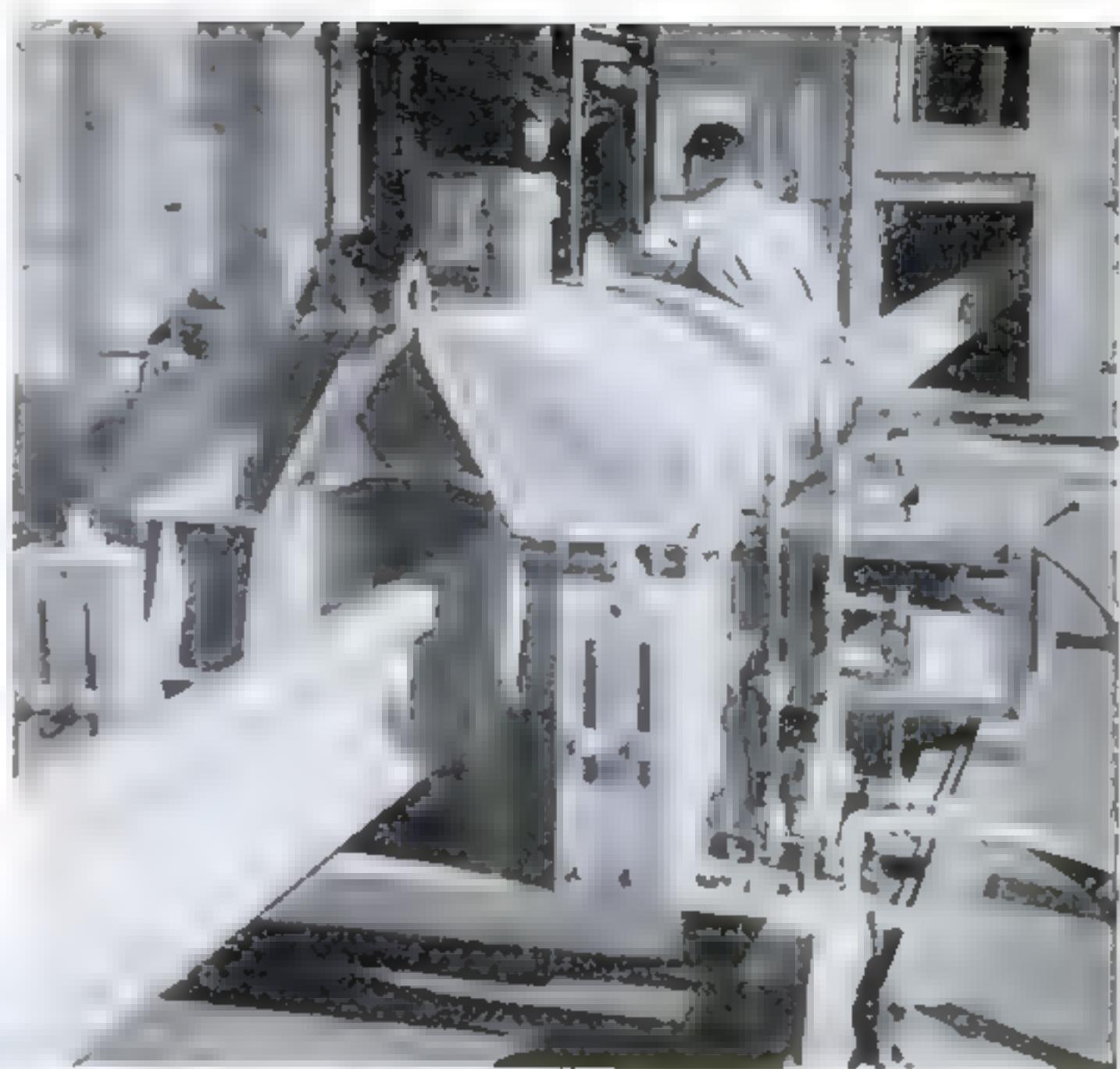
Drawing by B. G. SEIELSTAD

#### **HOW "VELVET TRACK" IS MADE**

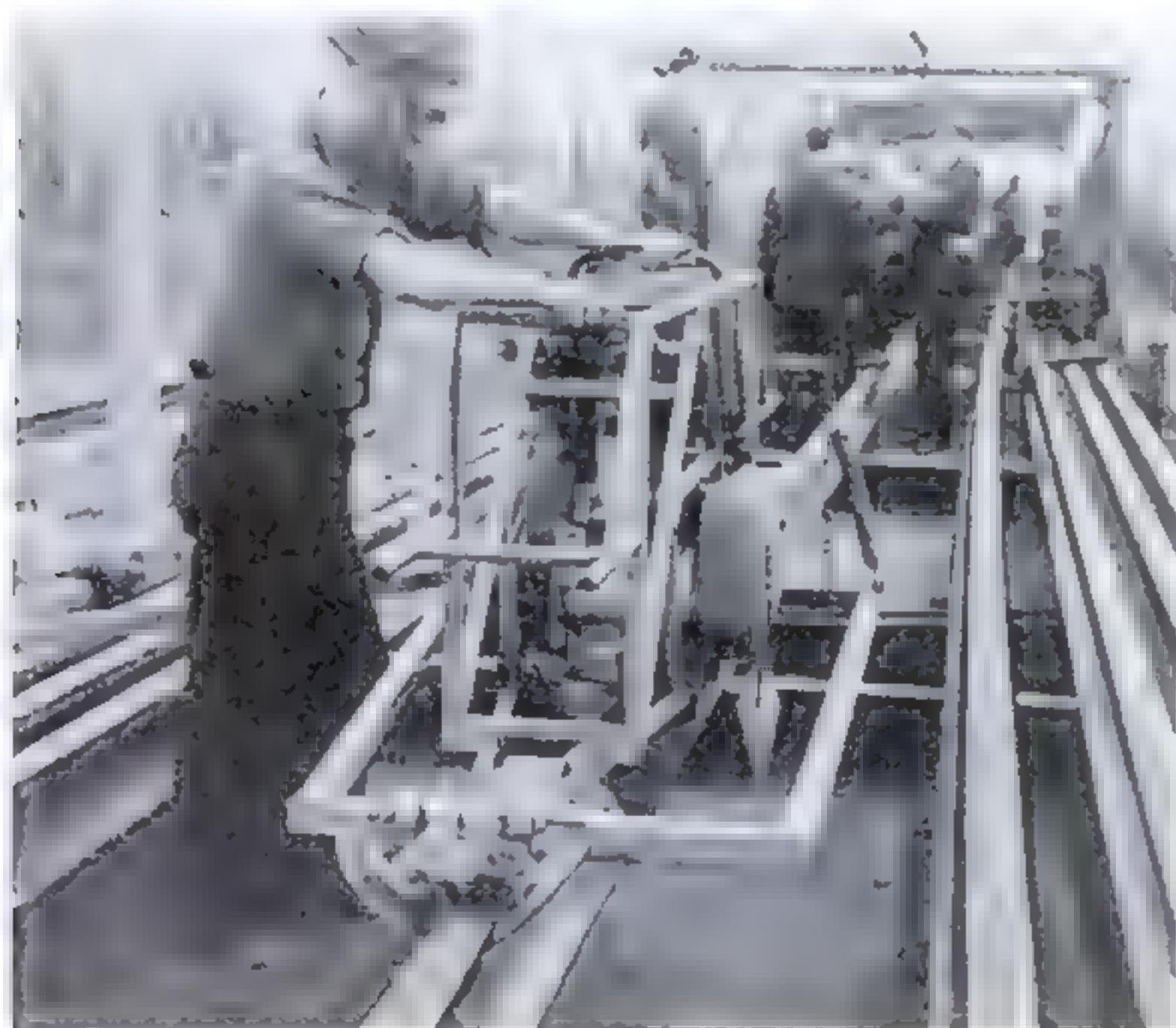
Operating like the production line of a factory, this welding plant on wheels turns regular railroad rails into sections of jointless track. While a new weld is being made, finishing operations are performed on previous ones at stations on the flat cars.



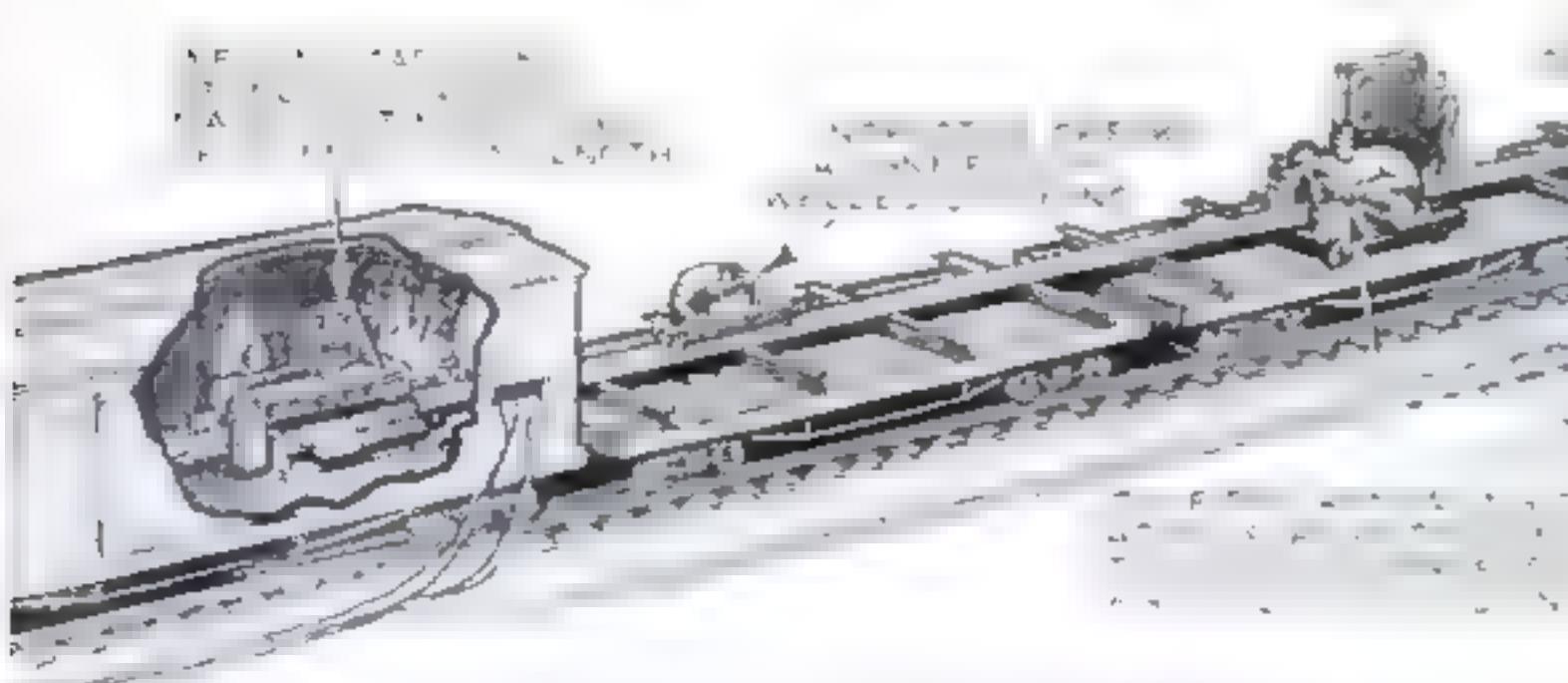
When a joint comes out of the welding machine, it first is checked for alignment, as shown at the left. Lack of alignment would create a bump in the "velvet track."



Then the joint is moved on into the oil-fired furnace seen at the right. Here heating under accurate temperature control relieves stresses set up by the welding



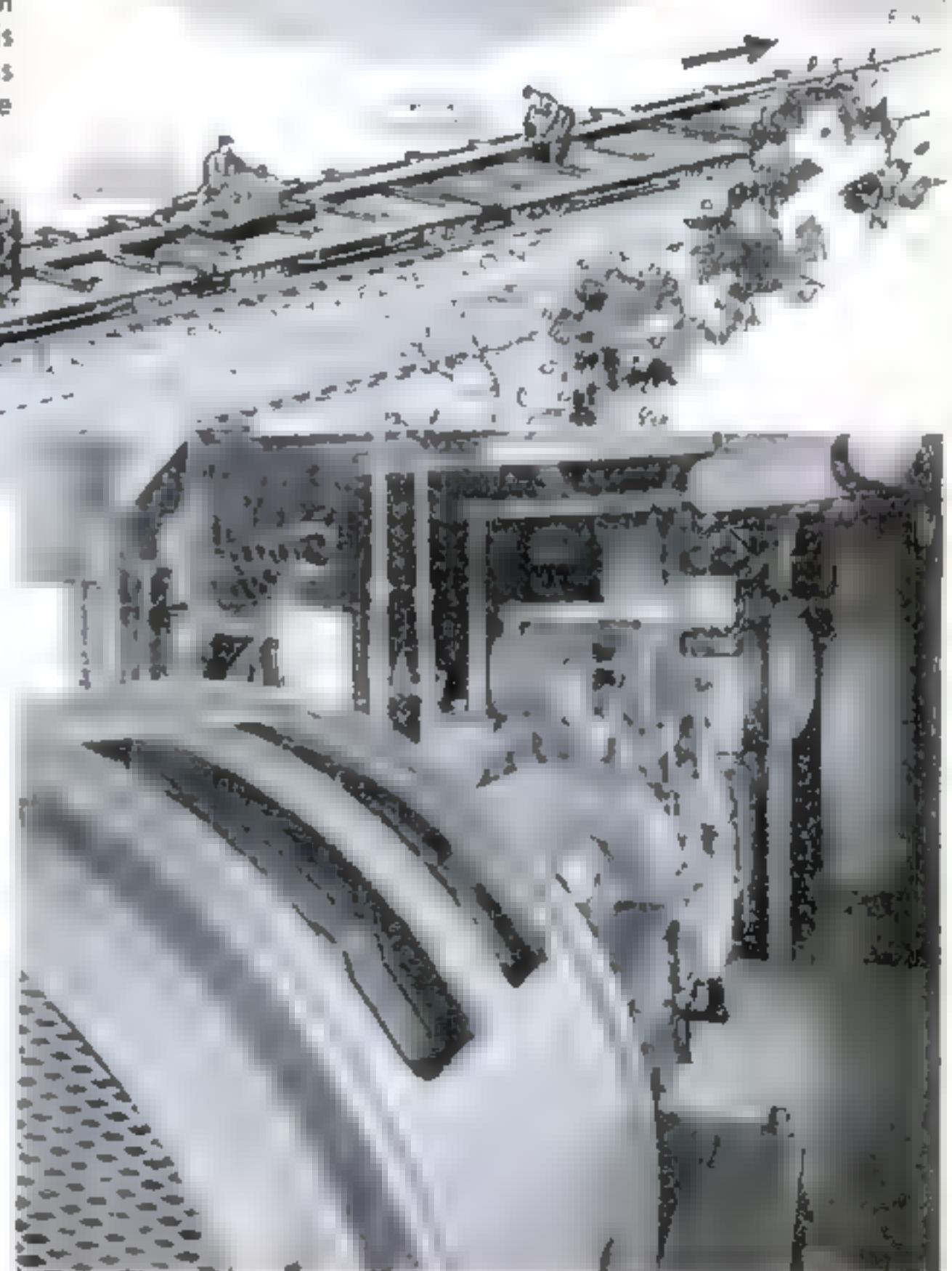
After each welded joint has been annealed, it is smoothed and shaped with motor-driven grinders. In the photograph above, the head of the rail is being smoothed. The hand grinder at the right is used to remove excess metal around the weld immediately below the rail head and above the base



At the left, a long welded rail laid loose upon flat cars on its way to be laid, bends easily as the train goes around a curve



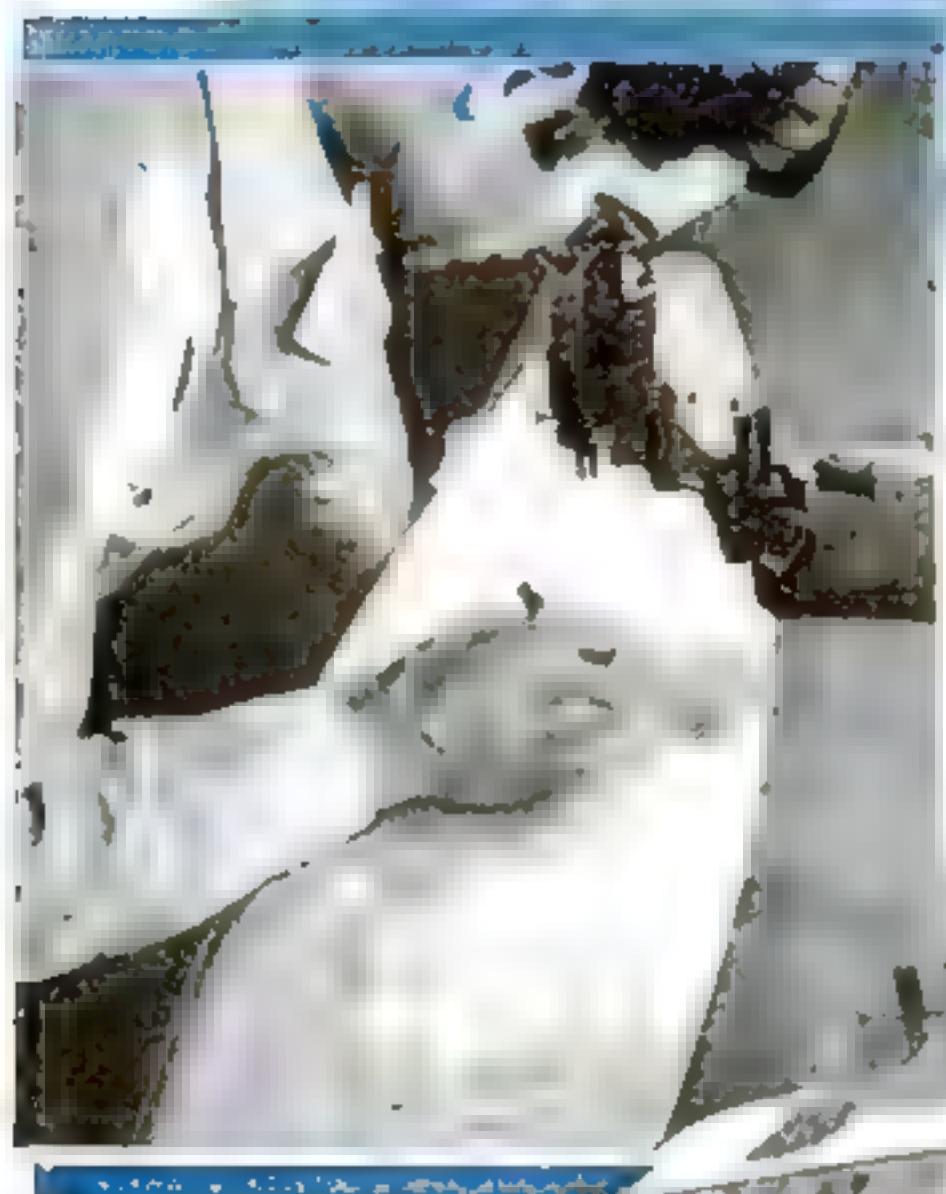
The main generator of the welding train, seen at the right, is driven by a turbine using steam piped from a locomotive boiler





# Safety in the Air

... DISASTERS SPUR SEARCH FOR NEW PROTECTIVE DEVICES



An all-metal propeller being inspected with a microscope for flaws that might cause an accident. At the right, a fuselage is suspended upside down to test the strength of the mountings for the engines.

A modern airliner in flight. Can engineers make plane travel as safe as it is fast?

**S**IXTY-SIX deaths in air-line crashes in a single period of ten months! Stunned by these official 1937 figures, aeronautical experts are concentrating their efforts on developing new safety measures to reduce the hazards of travel by air.

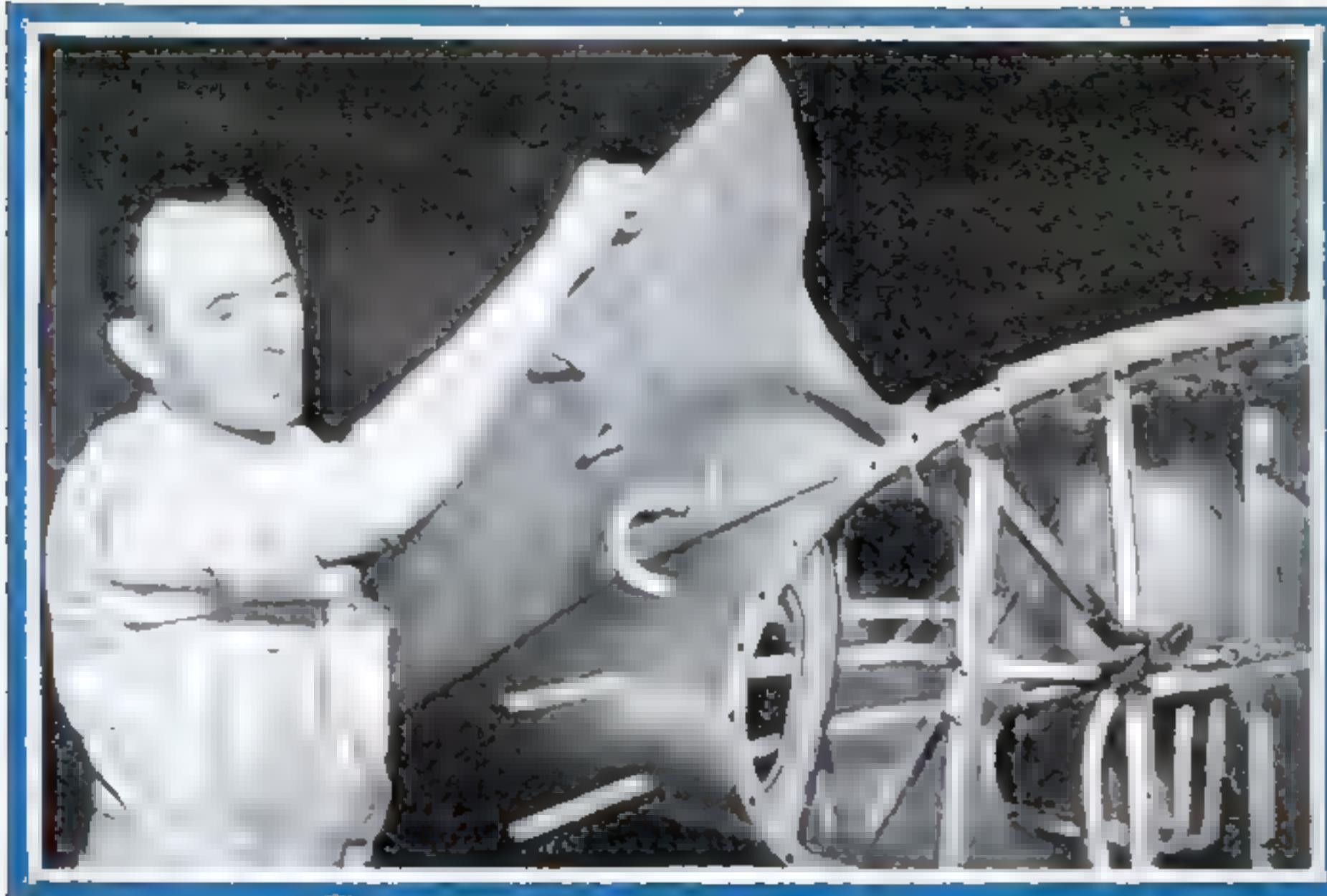
During recent months, a giant Boeing transport plane, fitted as a flying laboratory and staffed by a group of aviation technicians, has been deliberately hunting storm areas near Seattle, Wash. Grounded only by clear weather, the plane has flown into hundreds of electrical storms while radio experts attempted to determine the cause and cure of "snow" static, the electrical disturbance that blots out plane radio communications, and leads to disaster.

This is only one of the host of measures that scientists are taking in the struggle for maximum safety in air travel. At Dayton, Ohio, U. S. Army engineers are experimenting with a revolutionary blind-landing device, with which pilots approaching fog-bound airports could throw a master switch, and let radio-controlled mechanisms maneuver the ship to a safe landing.

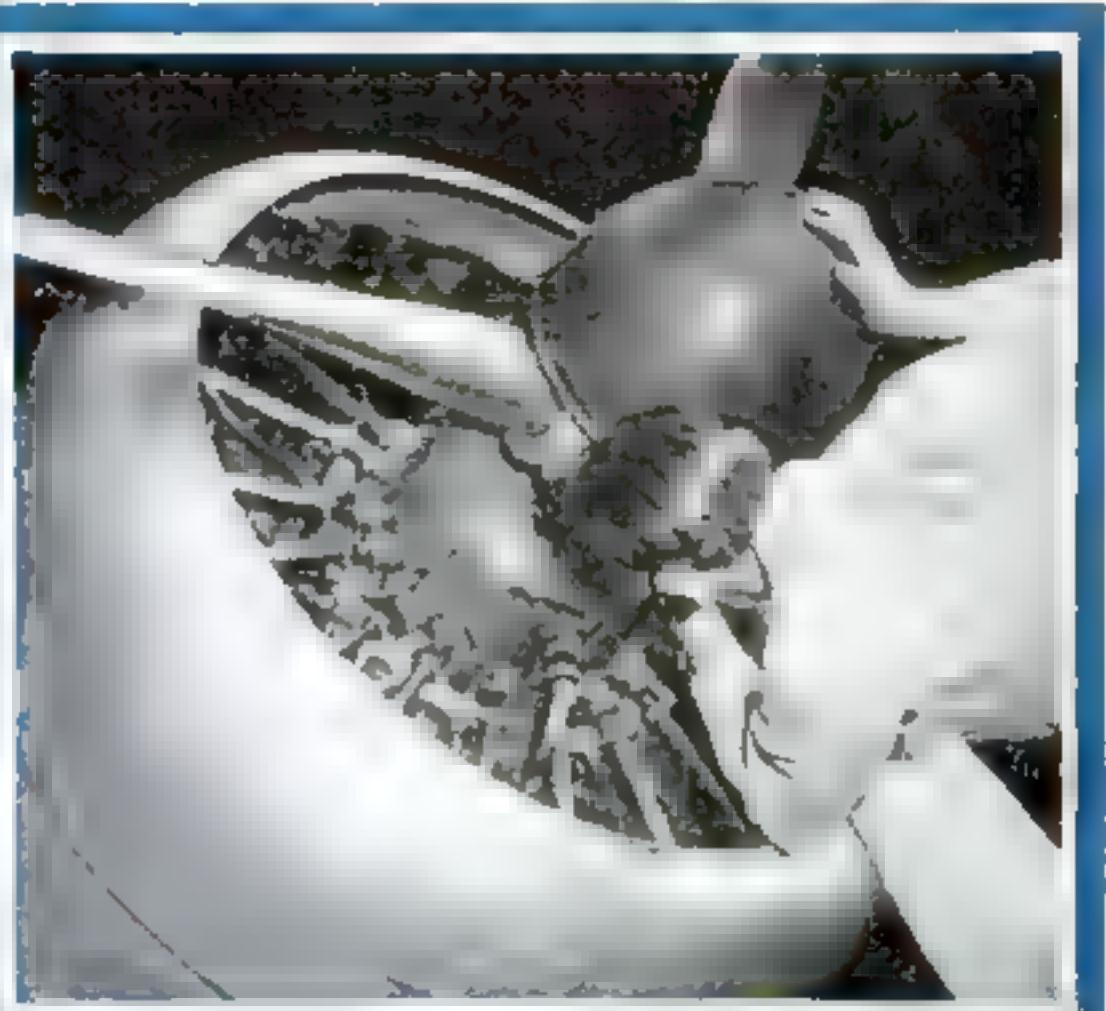
Glass noses that shield loop antennas, improved de-icing units, automatic fire extinguishers, ingenious instruments for making meteorological observations—all these are listed among the new safety devices for air-line use.

The field is wide open for inventors interested in mechanics, aeronautics, meteorology, and a dozen other branches of science to work out new devices and methods that will make safety records match the speed and efficiency standards of American air transportation.

The trailing wing edges seen on this plane add lifting power in take-offs and slow the craft down for landing



At left, a workman is applying a de-icer covering to a wing to reduce the danger of ice forming on the edge. Below, installing a device to throw antifreeze onto the propeller



New types of direction-finding apparatus, like this loop-antenna control, guide big airliners



Station superintendent and pilot checking the flight analyzer's record of a trip. The device, seen installed in a plane at left, shows whether the pilot has obeyed orders



At the nose of the plane, the antenna itself is covered by a glass globe that cuts down interference by metal and increases the radio's efficiency

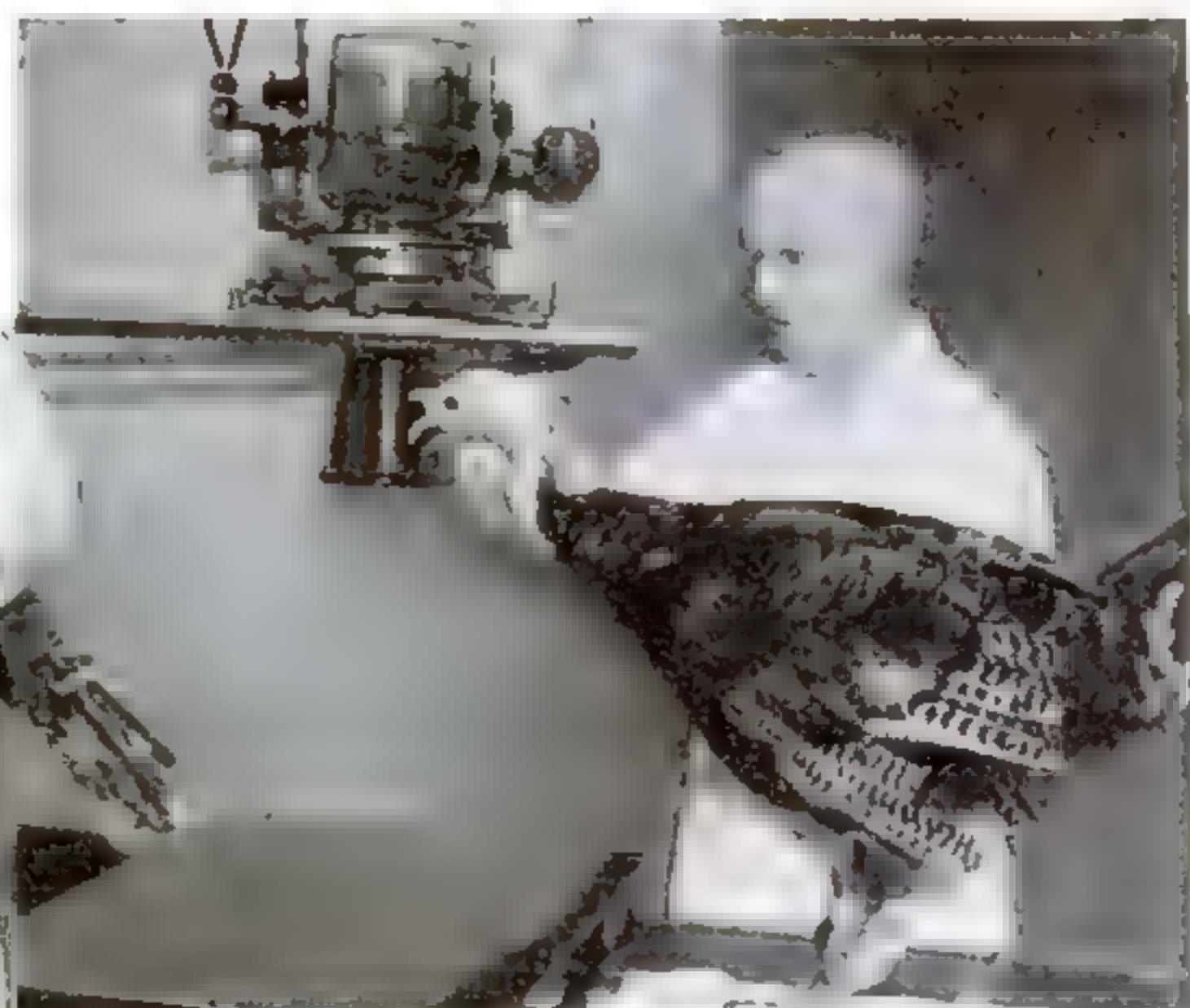


Technicians inside a flying laboratory testing the effectiveness of various types of antennas for the elimination of static. The photograph, right, shows three of the antennas tried—a ring at the nose, one under the body, and a football-shaped device

## Turkeys Are Bred for More White Meat



Experts are examining and weighing these turkeys, bred to yield more white meat



A turkey being X-rayed, above, to show its bone structure

MORE white meat on turkeys is one of the purposes of scientific breeding methods developed by experts of the Northwestern Turkey Growers Association. In the last three years, selective breeding of prize birds has increased their average weight three pounds. The superior turkeys have an average weight of fifteen pounds, with approximately two pounds more white meat than turkeys studied ten years ago. X-ray pictures of the birds are used to advance the knowledge of breeding methods.

## Tiny Handmade Forests Have Trees of Bent Wire



Tiny woodsmen stand in the foreground of the realistic forest

SIX months of painstaking work are required to fashion each of the miniature forest exhibits soon to be displayed in the Harvard University Museum of Forestry. Copper wire of varying thickness is used to form tree trunks and branches, which are set in place before a cyclorama background to produce in true perspective a diminutive but astoundingly realistic model of genuine forest growth. The photograph above shows how realism is achieved through skillful bending, fraying, and soldering of wire, in addition to accurate scaling and placement.



A picture of a Japanese birch is the model for the tree being fashioned above. Left, soldering on the branches of a wire tree

# Home Chemist BECOMES A Wizard OF GLUE

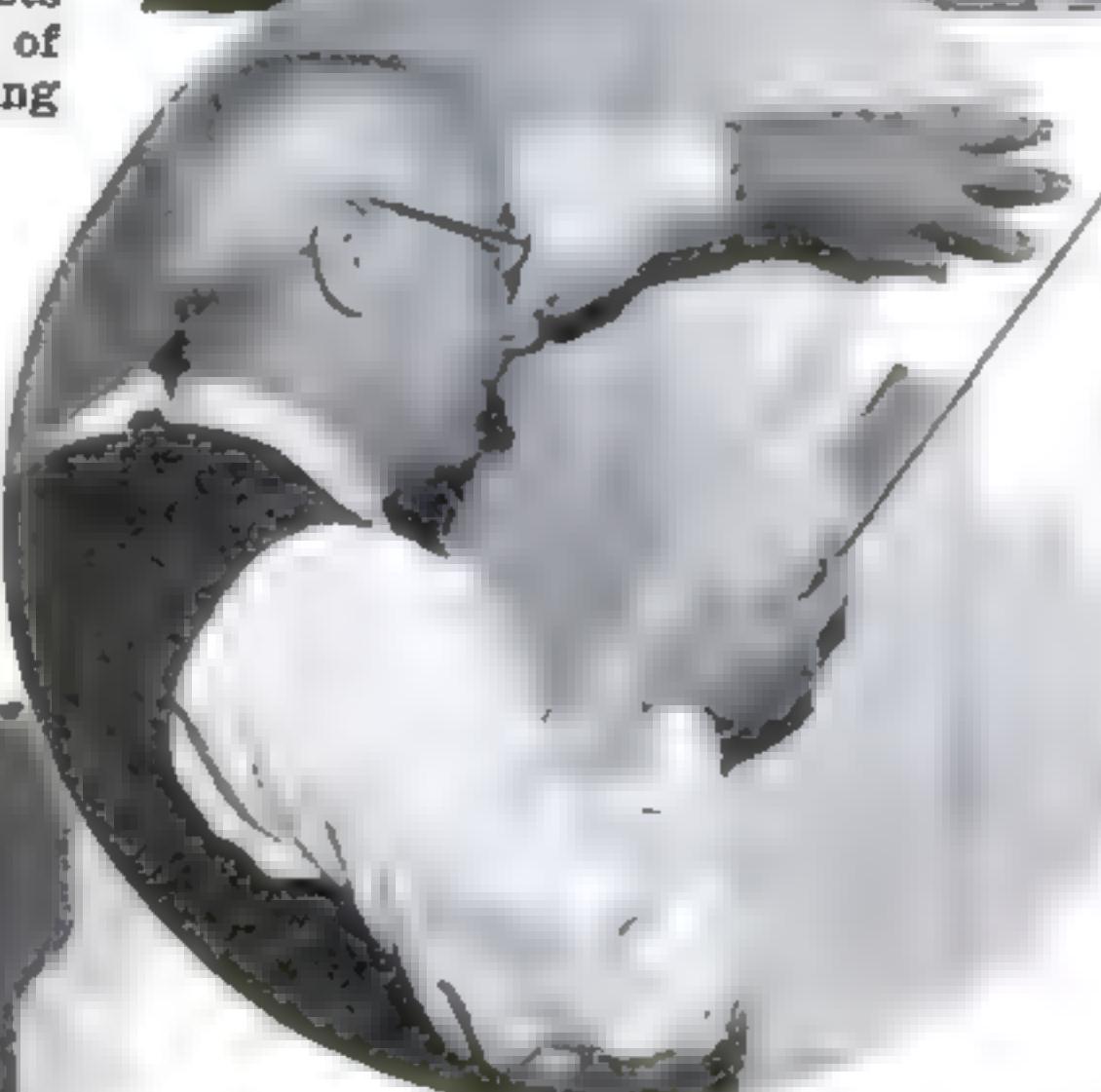
WORKING in a cellar laboratory and using chemicals bought at a corner drug store, Benjamin K. Albrecht, a fifty-nine-year-old retired salesman of Rowayton, Conn., is achieving a reputation as the wizard of glue. With makeshift apparatus, he is solving problems that have baffled the chemists of the largest laboratories.

Only a few days ago, it was announced that when the New York World's Fair opens in 1939, thin sheets of metal glued to the walls of several of its buildings will introduce a striking and novel form of interior decoration. For the first time in history, metal can be glued successfully to wood and plaster. And, the adhesive which makes the feat possible is a product of Albrecht's Rowayton workshop.

Not long ago, I spent a day with the home chemist in his basement laboratory on the outskirts of the



Benjamin K. Albrecht at work in his basement laboratory at Rowayton, Conn., where he has solved problems that baffled expert chemists



This piece of metal was glued to a cellar door in 1935 in a test that led to the discovery of an amazing adhesive

Connecticut village. I found him going over a flood of letters which had arrived from all parts of the United States. Four hundred had come in two consecutive days, many of them asking for new glues for special purposes. While we talked, we were interrupted frequently by telegrams, visitors, and long-distance telephone calls. The industrial world is beating a path to Albrecht's door in search of new and improved adhesives.

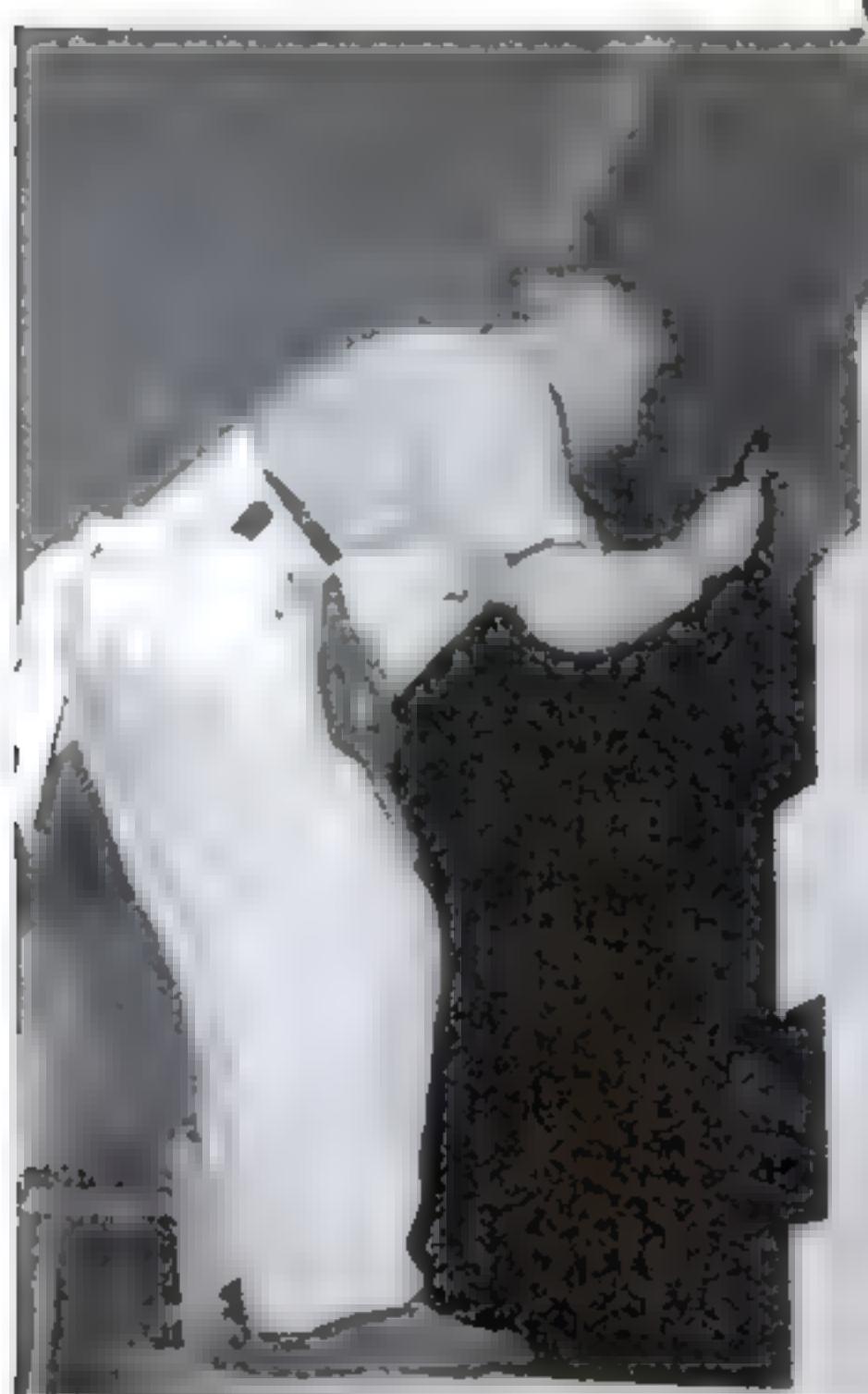
When the company for which he worked went out of business in 1930, Albrecht turned to his home-chemistry hobby for a livelihood. In half a dozen

years, he has become one of the outstanding free-lance glue experts of the country. All his work has been accomplished in one corner of the crowded basement of the home in which he has lived for thirty-three years. His workbench runs along one wall beneath a wide shelf packed to the edge with bottles, jars, and cans containing innumerable chemicals.

Near the house-heating furnace is a small, pot-bellied stove on which he melts his glues. In producing his new bonding materials, he employs animal glues, vegetable glues, latex, and casein. To such bases he adds oils, acids, paints, acetates, and a wide variety of dry chemicals. He still uses a homemade pair of scales with sheets of galvanized tin for pans and Lincoln pennies for weights.

One of the first products of his workbench was a new glue so resistant to moisture that it is now widely employed for sealing burial caskets. A little later, he combined latex and glue to form a rubber cement so strong it will outlast the canvas to which it is applied. Circuses now employ it for repairing tents, and at both the Yale Bowl in New Haven, Conn., and the Brooklyn, N.Y., baseball grounds, it is used to keep in good repair the immense tarpaulins which protect the playing fields from rain.

Before Albrecht solved the riddle of cementing metal sheets to wood and plaster, he (Continued on page 127)



A workman using one of Albrecht's adhesives to apply copper sheets to a wall for the New York World's Fair

This odd instrument produces tones like those from a cello



## Horns Made from Tree Trunks Give Odd Musical Tones

HORNS hollowed out of tree trunks are used by native musicians in the Tyrol region of Austria. The novel instruments, said to imitate the tone of a cello, are fitted with stops so that they can play all the notes of the scale. Tree bark is left on the horns in the belief that it has a softening effect on the tones of the instruments.



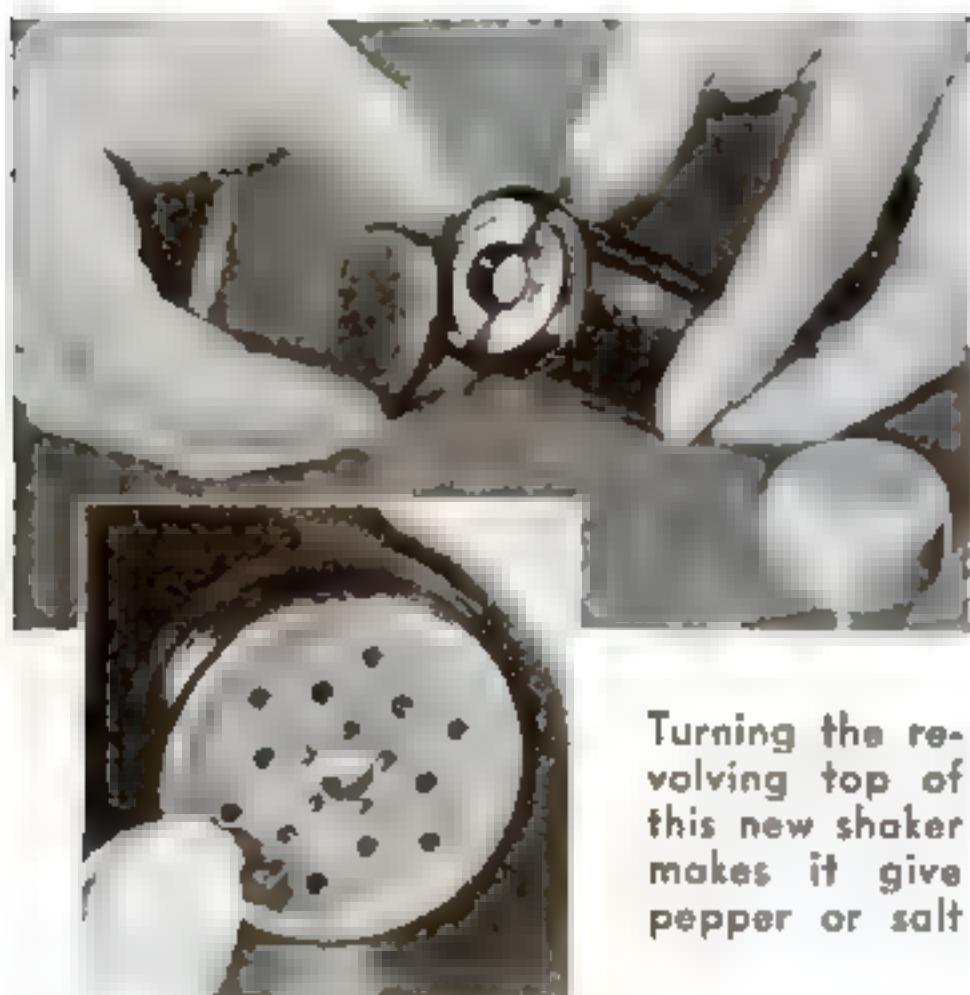
A small group of Tyrolean musicians playing on their wooden horns



## Tool Grinds Auto Ignition Points

WHIRLED like an egg beater, a new portable grinding tool makes it easy to reface automobile distributor points without removing them from their mountings. An abrasive wheel is automatically held in alignment between the two points by spring pressure.

## Double-Action Shaker Gives Salt or Pepper



Turning the revolving top of this new shaker makes it give pepper or salt

ETHER salt or pepper can be shaken from the same end of a handy shaker now available. Pepper is contained in a small cylinder within a larger one filled with salt. A perforated rotating top is turned to one position to dispense salt, and to another to shake out pepper.

## Model Street Bombed

DROPPING 500-pound bombs on a full-size reproduction of a London street, British airmen recently tested the effect of aerial bombardment on the houses, water mains, sewers, electric transmission lines, and other structures of a modern city. The model street had been erected on the experimental range at Shoeburyness.

## Electric Brush Tests Enamel on Water Pipe



When the brush encounters a thin spot in the enamel, sparks fly

TO MAKE sure that waterproof enamel completely covers the sixteen-foot siphon pipes used in the construction of the Colorado River aqueduct to supply water to Los Angeles, Calif., inspectors use a novel electric brush. Connected to a power circuit by a trailing wire, the brush is drawn across the enamel surface as shown in the photograph at the left, emitting sparks at those points where the coating is less than the minimum thickness required.

## Insulation Checks Fires on Steamers

INSTALLED in the steel walls and floors of ocean liners, a new insulating material is designed to prevent the heat of a fire in one compartment from igniting material in adjoining spaces. The photograph shows the material being installed in the S. S. *Catherine*, said to be the first 100 percent fireproof liner.

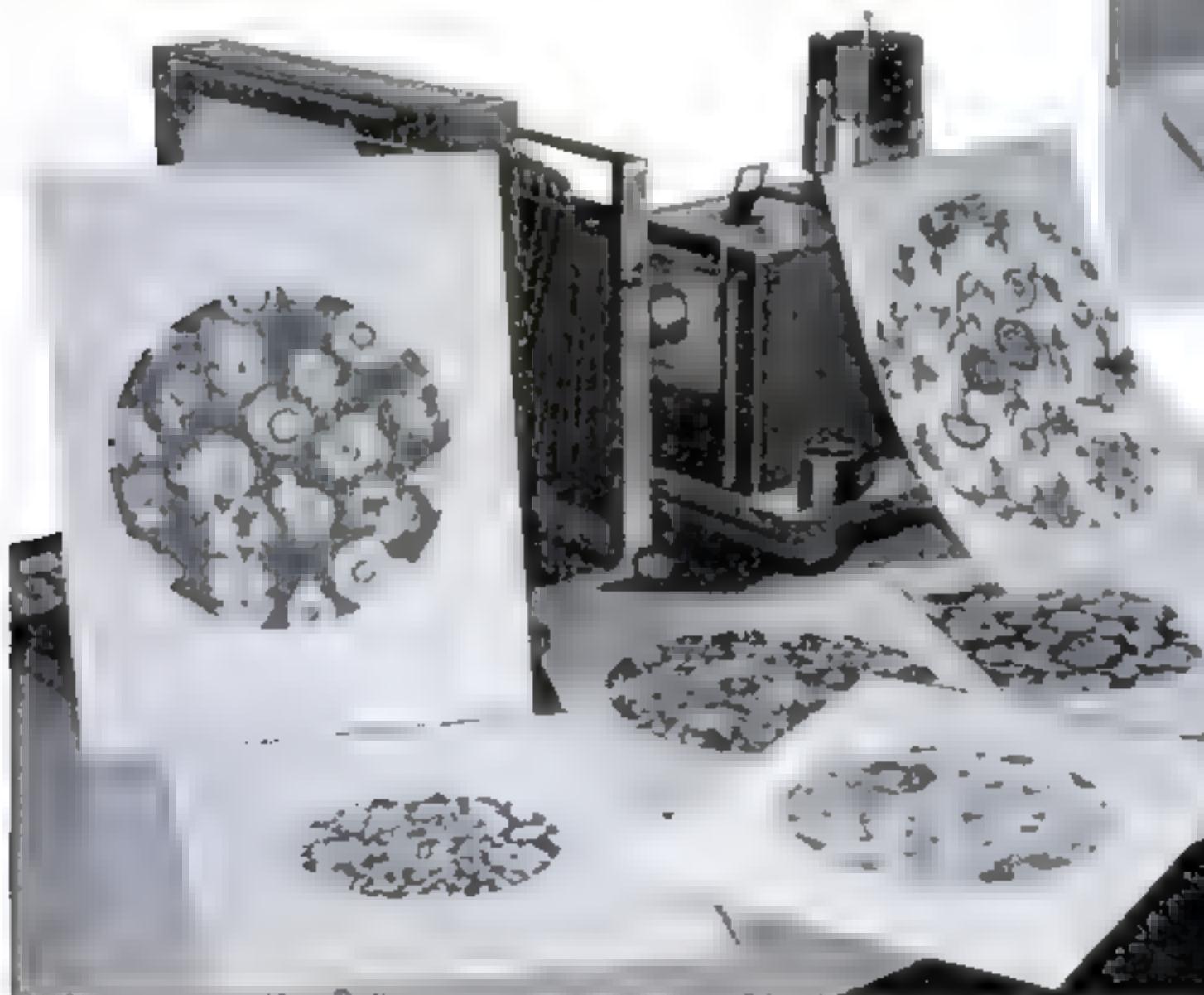


Blocks of insulating material being installed in a ship's hold

# Mechanical Designer Turns Out New Textile Patterns

SHIFTING mirrors and lenses within a compact projector provide two textile designers in a New York studio with an endless array of patterns suitable for print fabrics, wall paper, carpets, and upholstery. Small cardboard disks, each holding a different basic design, are placed in the projector and the image is thrown upon a ground-glass viewing screen. As the machine is operated, the design shifts on the screen into an infinite number of variations. Watching the shifting patterns appear in color on the screen, the designers can stop the machine at any time to record any pattern that strikes their fancy.

A few of the countless designs produced by the ingenious machine are seen below



This projector throws shifting patterns on a ground-glass screen

Cardboard disks containing the basic designs

## Springs Exercise Pianist's Fingers

EASILY attached to any piano, a curious device is said to aid music students in acquiring speed, suppleness, and correct touch on the piano keyboard. Rings worn on the fingers are connected by means of coil springs to supports that slide along a horizontal bar mounted above the keys. Following the hands up and down the board, the springs provide tension to give the fingers muscular training.



Springs are fastened to loops that slide along a bar above the keys



## Plate Guides Nails To Mend Hip Bones

BROKEN hip bones are nailed together quickly by means of a surgical technique just perfected. The surgeon employs a fan-shaped plate, marked by guide lines converging from its rim. Placed over the hip, this unit, in conjunction with X-ray photographs, enables him to determine the exact direction in which to drive the nail that binds the broken bones together. Nails are made of a special alloy.



To open the car door, the proper combination of buttons must first be pressed

The combination is set by plugs in a concealed board

## Alarm Lock Balks Car Thefts

BURGLARPROOF doors are now available for installation on cars of any make or model. Recessed buttons in a circular row on the outside of the door are pressed in a predetermined order to open the lock. If the wrong combination is pressed, an electric mechanism sounds an alarm bell to attract the notice of passers-by.

# MAN v.s. RAT

Destroying four times as much property every year as fire, the rat looms as a major enemy of human civilization

By E. W. Murtfeldt



Wearing gas masks, these men are releasing deadly fumes in a steamer's hold to kill rodents. All vessels are required by law to receive this treatment at least twice every year

Dead rats being collected on a ship after fumigating, to be examined. In this manner, seaport cities keep check on the importation of diseases

AS DUSK settled over New York City, one evening not long ago, the second largest power plant in the world suddenly broke down and plunged a huge area into darkness. Crowded subway trains stalled in black tunnels. Elevators stopped, movies faded from the screen, traffic lights blinked out, surgeons desperately completed delicate operations by flickering candlelight. A paralyzed, helpless city groped in darkness.

When service was restored, five different investigations probed for the cause of the power breakdown. Engineers knew that a short circuit had caused a crippling fire—but what had caused the short circuit? At last, examiners tracing a cable leading from one of the giant generators found one spot where insulation had been gnawed and chewed to expose the bare wire. Below, they spied the remains of the culprit—the stiff, singed carcass of a rat.

This near catastrophe is symbolic of the great damage caused by the myriads of rats that infest the nation. Government figures place the rat population of the United States at well over 100,000,000—approximately one rat for every man, woman, and child in the country.

Experts say that a rat eats two dollars worth of food a year, and causes many times as much damage to merchandise and property. A modest estimate of the total annual destruction attributed to rats in the United States is over \$1,000,000,000—four times the nation's annual fire loss.

Most householders know that rats steal food, but few are aware of the extent of their destructiveness. Rats will eat practically anything, and will destroy much that has no possible food value. In warehouses, on ships, in trains, they gnaw and destroy gloves, hats, blankets, books, leather, furniture—nearly every article of commerce. They damage wood foundations and walls. They have gnawed through mail sacks and ripped letters to shreds, caused floods by gouging holes in dams, started fires by gnawing on match heads.

Some of the damage they do is almost unbelievable. Experts state that rats often gnaw the feet of horses until they bleed. Three circus elephants recently

# ... Experts Hunt Down a Brazen Thief, Vandal, and Killer

had to be destroyed after rats had eaten into their ponderous hoofs. Gas explosions and fires have been traced to rodents gnawing holes in lead gas pipes. According to a Utica, N. Y., florist, a band of rats once stole more than 500 carnations from his flower vault.

When starved, rats lose their natural timidity and will attack cats, dogs, and even human beings. Not long ago, an English workman descended into a coal mine that had been closed for several weeks. No one ever saw him alive again. Hordes of starved rats attacked and killed the unfortunate miner, whose bones were later discovered. And in a slum borough of London, a mother and her children were afraid to go home from work until the father joined them. Rats regularly took possession of their rooms as soon as the family left them, and would attack the children if not beaten off with a club.

How does science combat this (*Continued on page 137*)



This is the way to set a cage trap. Place the opening near the rat hole and cover the trap with burlap



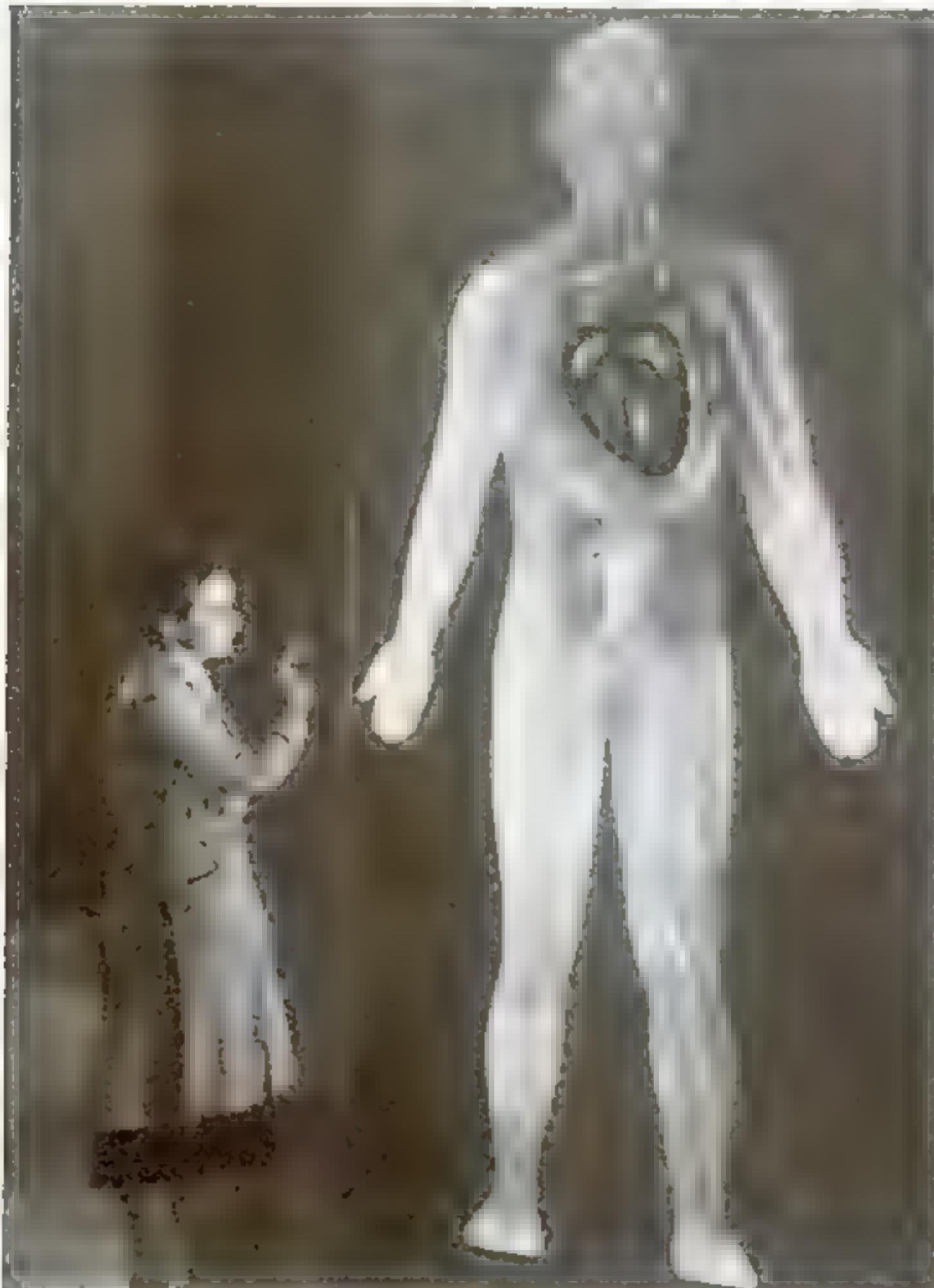
A laboratory worker combing the hair of a dead rat to see whether it contains fleas carrying bubonic plague



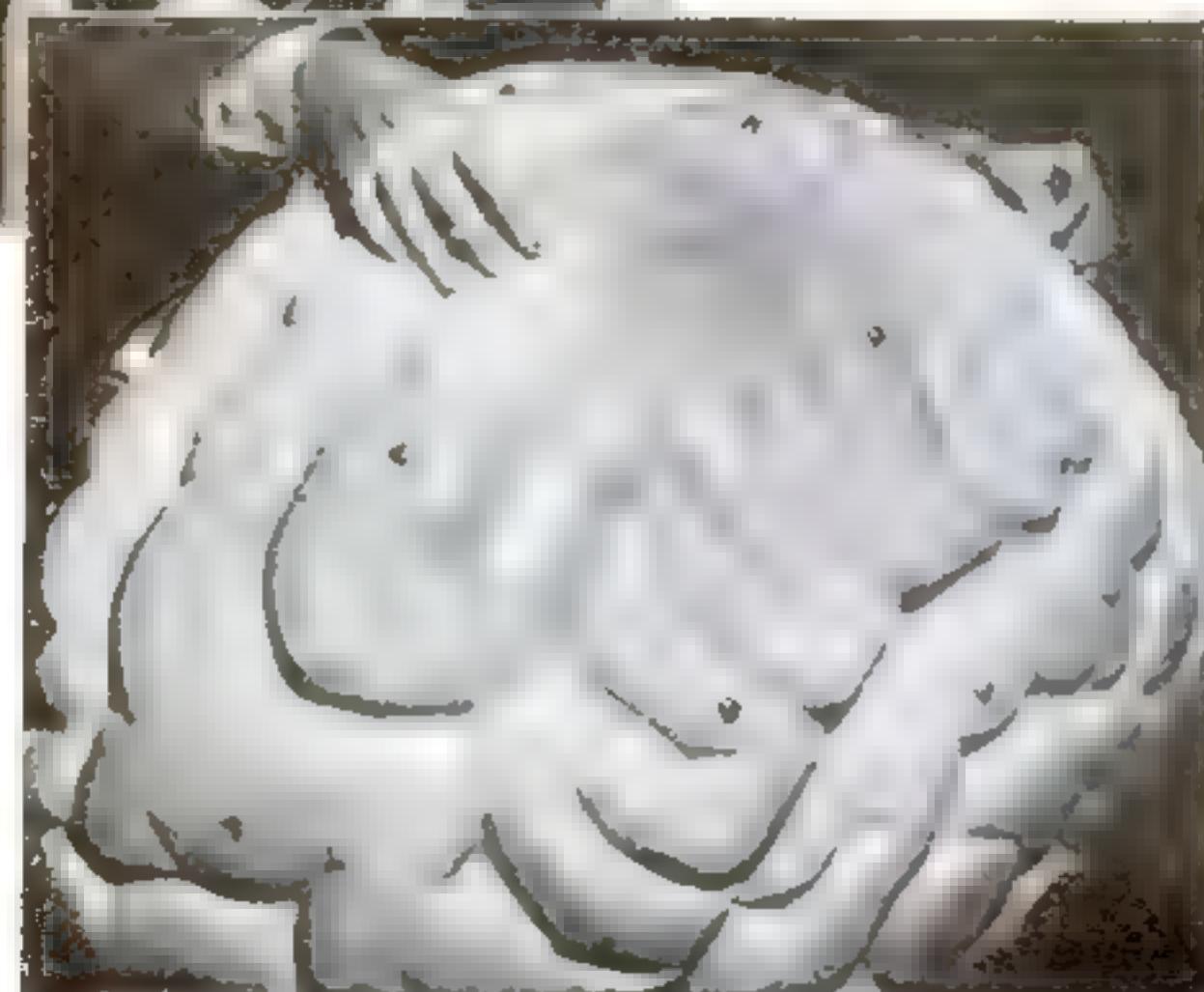
Autopsies on sample rats reveal infections that might be spread among human beings to cause grave epidemics

At the left, exterminators are killing rodents with gas. The hose is being thrust far down into the hole

**ARTIFICIAL HEART.** The massive illuminated human figure below illustrates the circulation of the blood. When a push button is pressed, valves in the mechanical heart open and close as colored liquid is pumped through the body. At right, a visitor is peering into a cabinet to see how the pupils of his eyes contract in light



**BEHIND THE SCENES.** Rear view of the blood-circulation exhibit, showing the motor and pump that force liquid from two tanks through the huge manikin



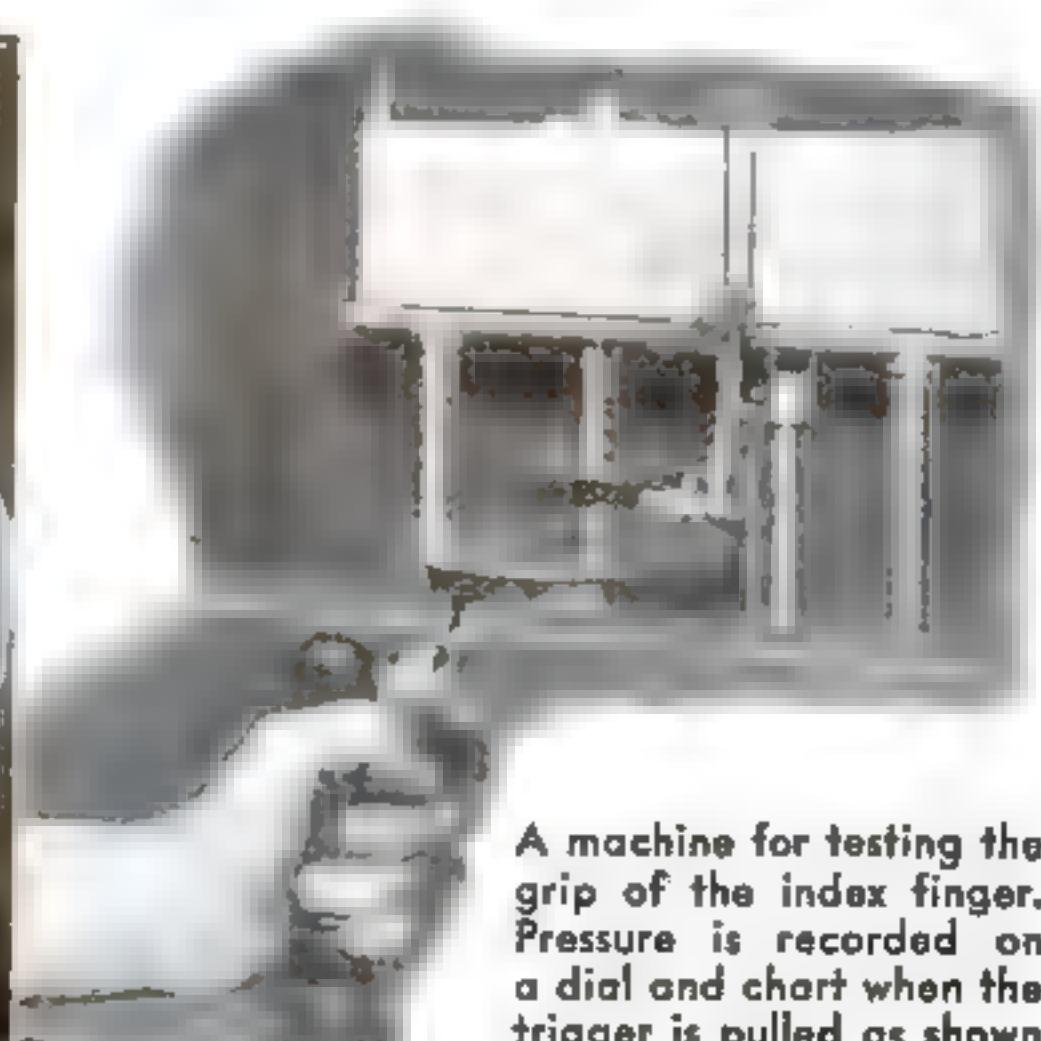
**MASTER MIND.** This gigantic representation of the brain is set with push buttons which, when pressed, indicate on a chart the parts of the body controlled by various sections of the brain



# Scientific PEEP SHOW TELLS HOW OUR BODIES WORK

ILLUSTRATING with working models the many operations of the human body, a novel exhibition recently opened at the New York Museum of Science and Industry resembles the side show of a modern amusement park. By pressing buttons, turning cranks, and pulling levers, visitors can test their strength, their lungs, and their voices and see for themselves how blood circulates, how their muscles work, and a host of other interesting details. Controlled by a maze of motors, the exhibits provide a fascinating introduction to the mysteries of human anatomy and physiology.

Bending over a curious smell machine, the visitor can produce burnt, fruity, or putrid odors at the mere touch of a lever. Striking a note on a piano keyboard lights a series of bulbs to show the range of the human voice. Pressing buttons that protrude from various parts of a plaster torso results in the illumination of charts showing what might be the cause of pain in any specific part of the body, while twirling the dials on another exhibit shows the visitor how much longer he may reasonably expect to live. Other push-button exhibits are supplemented by wall charts, graphs, and anatomical displays that provide the museum visitor with a scientific peep show on the structure and operation of the human body.

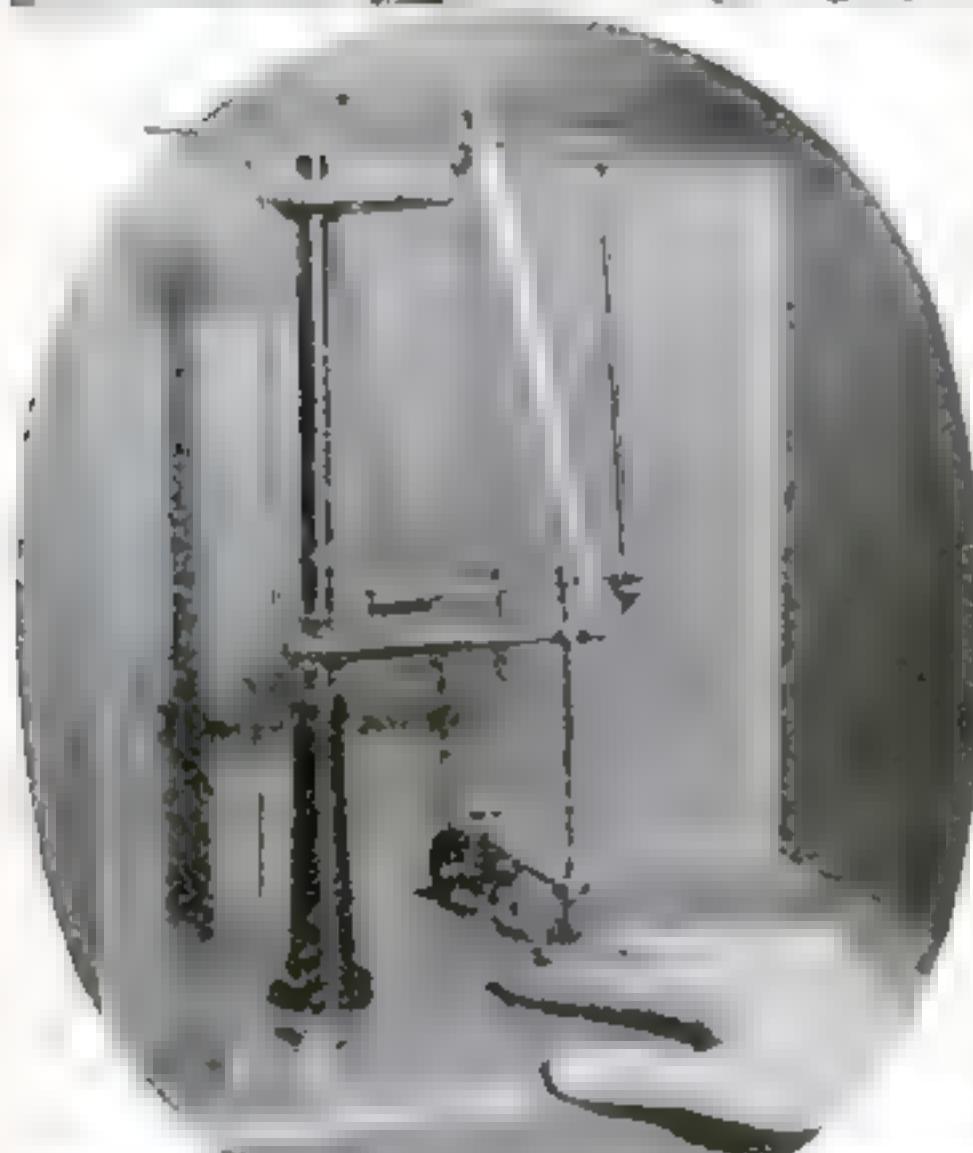
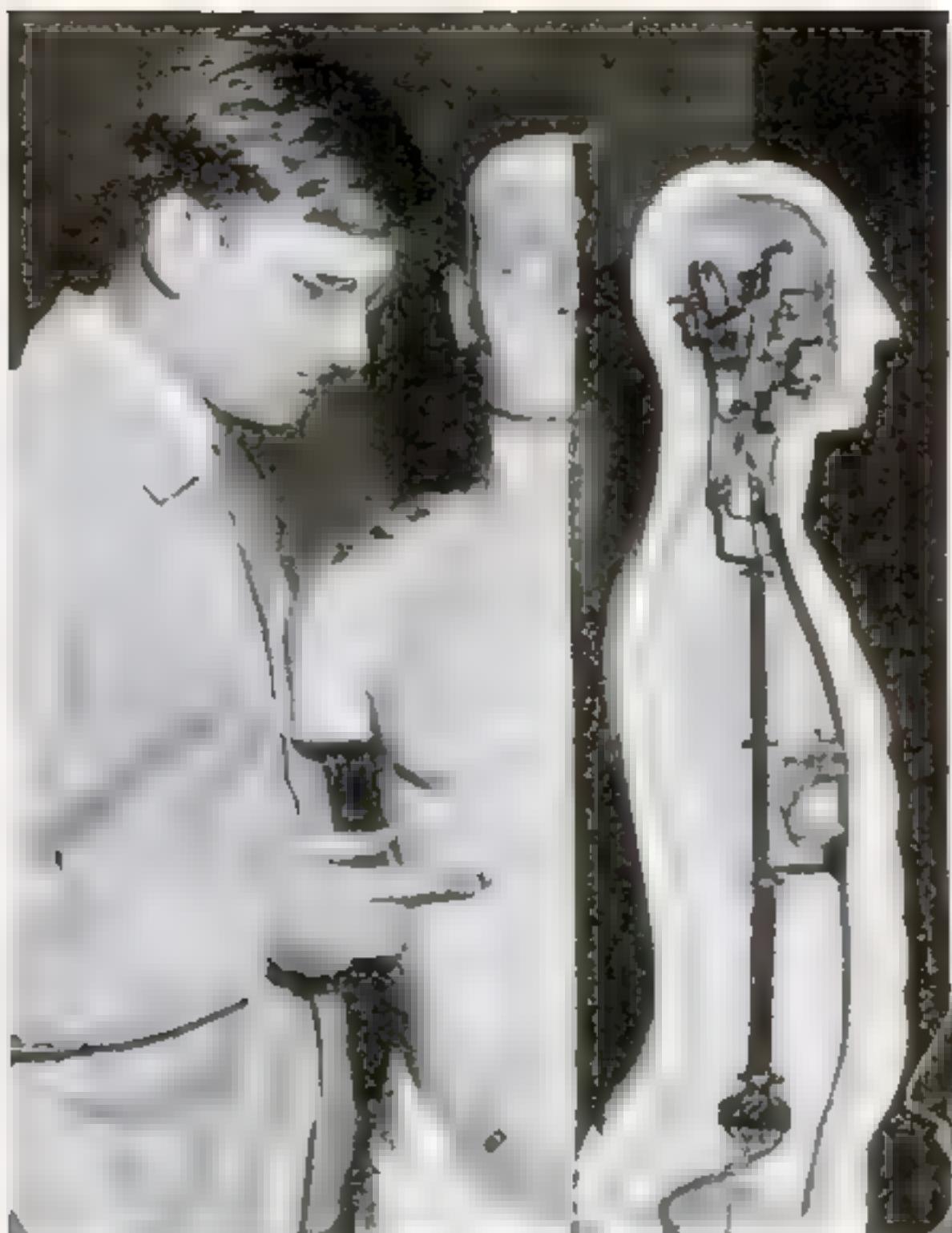


A machine for testing the grip of the index finger. Pressure is recorded on a dial and chart when the trigger is pulled as shown

### SOURCES OF PAIN

Buttons in various parts of the figure at the left are pressed to light up a chart that shows what may cause pain in each area. The dummy is opened to reveal the switch system

Nearest approach to the familiar chamber of horrors is the "book man," below, made in vertical sections that open up to show the internal structure of the human body



See your own pulse! A finger nail placed in contact with a rod in this device causes an indicator to swing in time with the heartbeat



The compass of the human voice at various ages is shown by the exhibit seen at the left. When a visitor strikes one of the notes on the keyboard, the corresponding note lights up on the musical scale, and the chart above it indicates the ages at which the tone is produced

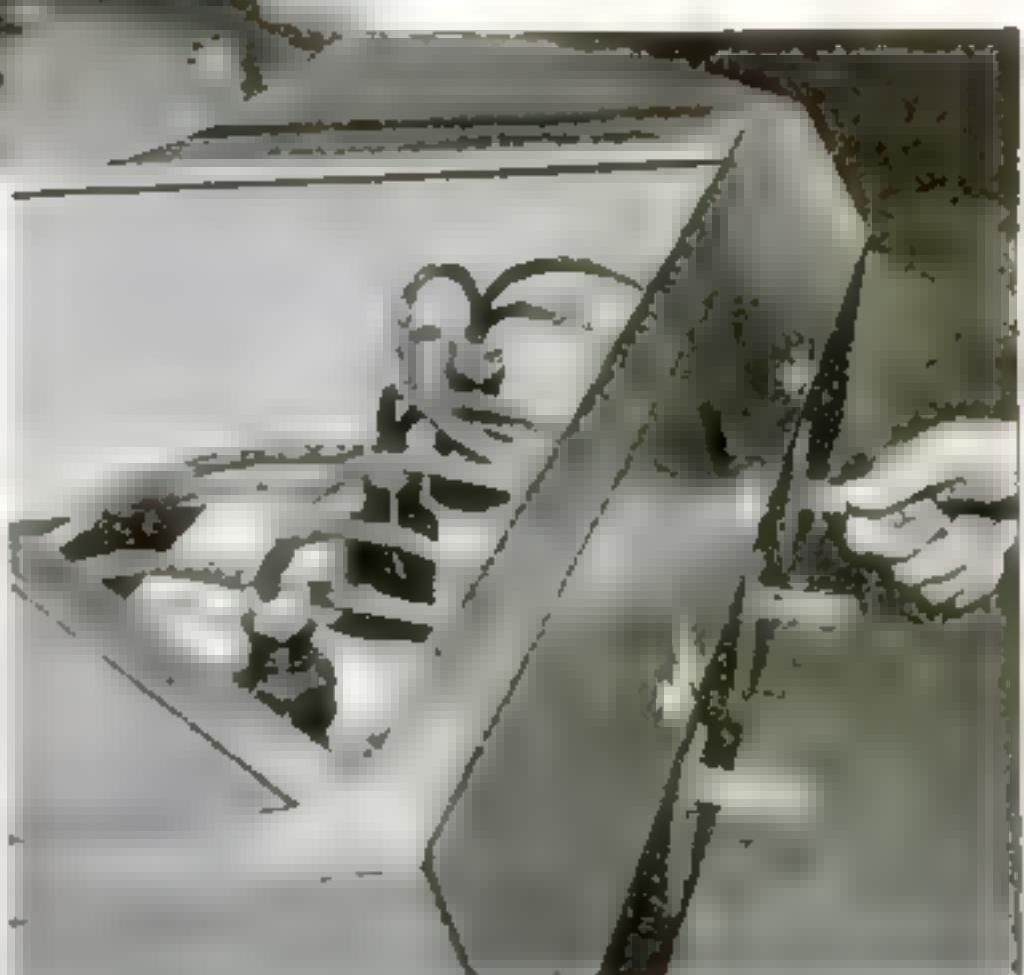


**STRONG-ARM ACT.** A rubber bulb, pumped full of air by means of a foot pedal, moves the arm bones in this exhibit to demonstrate how muscles work. The knob helps control the movements



### SMELLS MADE TO ORDER

"Phew," this visitor says, as he gets a whiff from the "smell machine." Pressing a lever releases odors from bottles seen in the picture below. By pushing two or more levers at once, additional smells are easily produced



## Huge Figure Carved from Solid Cheese

STANDING well over eight feet in height, a mammoth sculptured figure made entirely of cheese was the outstanding feature of a celebration of epics held recently in a large New York City hotel. The novel statue, mounted on a circular pedestal, represented the "King of Cheese," completely fitted with crown, collar, ruff, royal robes, and scepter. Some idea of the huge girth and stature of the cheese figure may be gained by comparing it, in the photograph reproduced at the left, with the girl whose extended arm fails to reach the statue's shoulder.



Dubbed "King Cheese," this statue was shown at a recent food exhibit

## Photographic Kit Is a Complete Laboratory

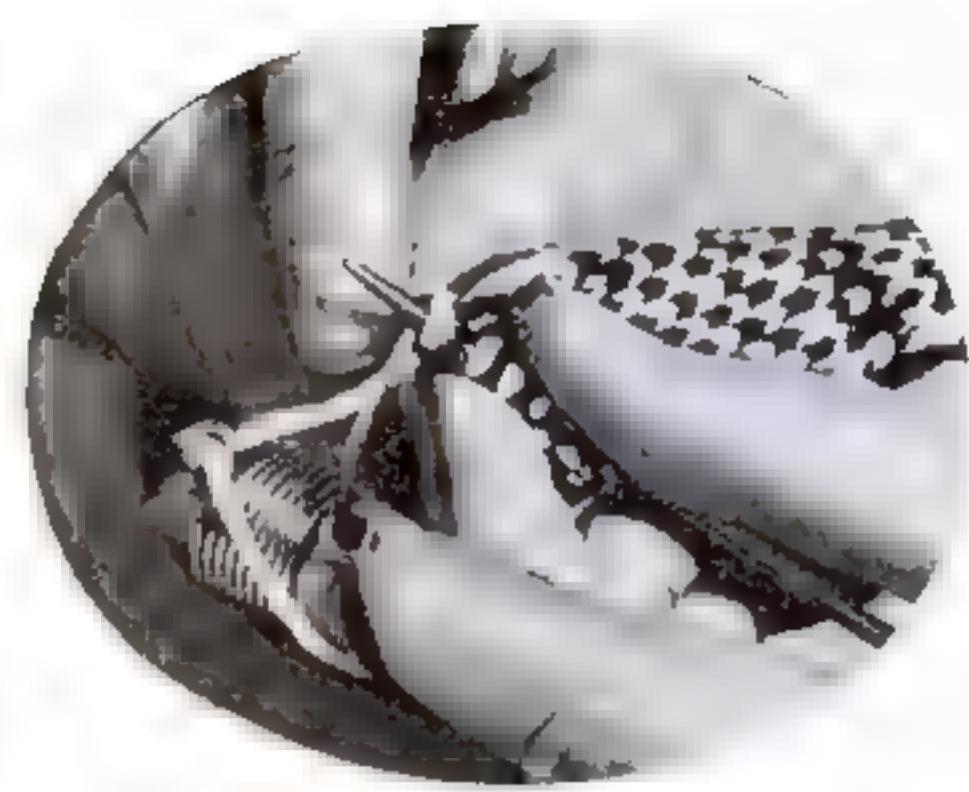
Compactly built, the kit at right holds a complete photographic set

The camera, enlarger, and other parts of the kit are shown below



## Laboratory

PACKED compactly in a wooden cabinet that is fitted with a convenient hinged door, the novel photographic kit shown in detail at the left is a complete picture taking and developing outfit for the amateur cameraman. In addition to a miniature camera and a complete enlarging machine, the assembly includes developing chemicals, printing materials, and a set of special filters and lenses for various purposes. Lantern slides can be prepared from developed films with a slide maker, and thrown on a screen with a compact projector which is also included in the kit. A handle on top of the cabinet makes it easy to carry from place to place.



## Loops Aid Knitters

KNITTING with yarns of two colors is made easier with the novel finger guide above. A spring worn on one finger has loops through which the yarns are threaded to prevent tangling.

## Train Messenger Bees

Bees, trained like carrier pigeons, are said to have been used in Japan to carry messages at thirty miles an hour for distances up to three miles.

## Watch Tells Time, Day, and Date

DAY of the week and date of the month appear automatically on a new calendar wrist watch. An extra hand moves once every twenty-four hours to indicate the current date along the outer rim of the dial, while the day of the week appears in a rectangular opening just below the numeral twelve.

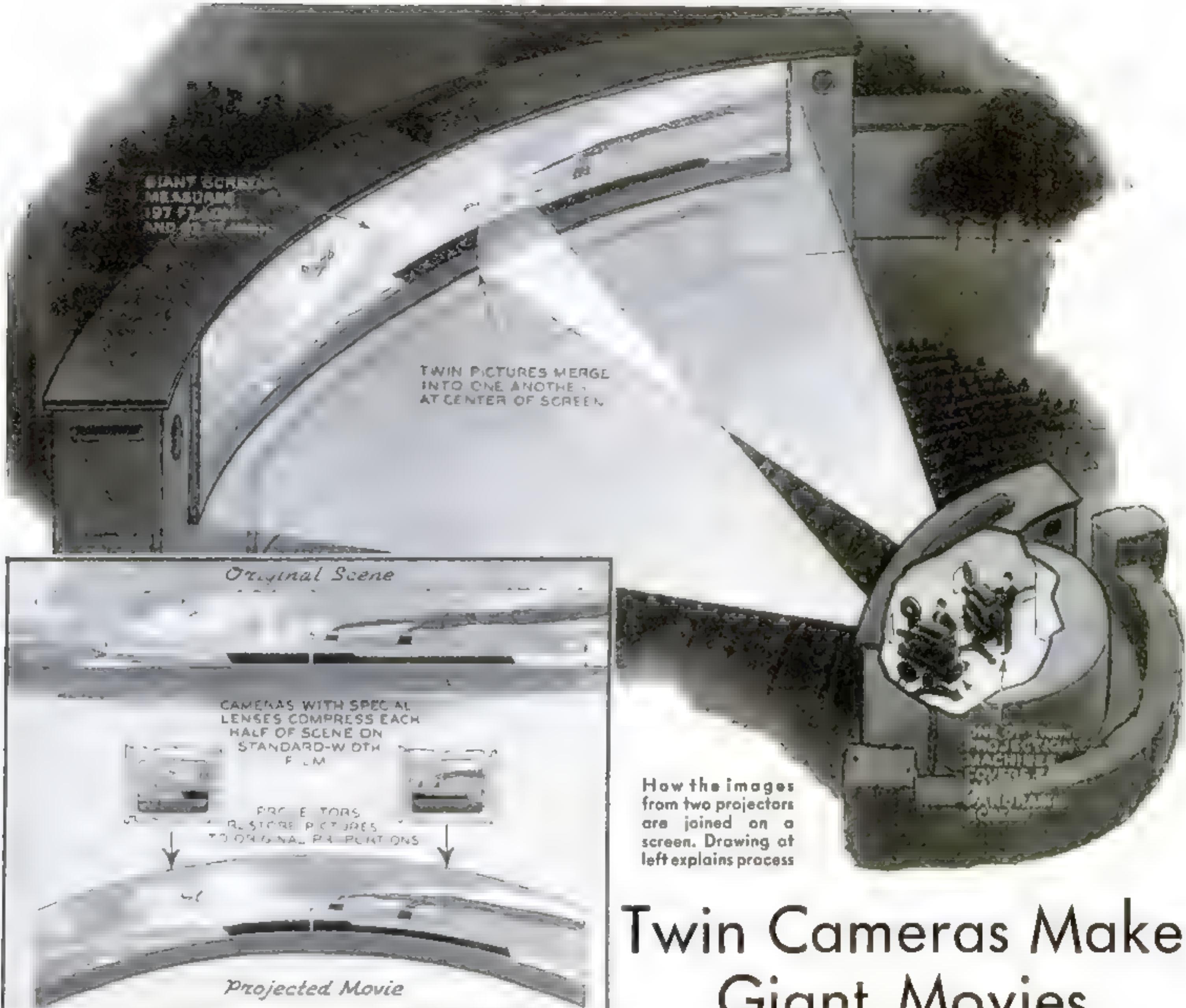


An extra hand indicates the date on rim of dial



## Students Build Device To Show Heart's Beat

USING only a few simple pieces of laboratory equipment, science pupils in the Maryville, Mo., high school constructed the novel heart-beat meter pictured above. Colored water in a U tube rises and falls about a half inch when the small funnel on the end of the attached rubber hose is held against a vein in the neck.



## Twin Cameras Make Giant Movies

**G**IANT motion pictures were projected on a huge curved screen thirty-three feet high and almost 200 feet long in a recent exhibition in Paris, France. Films projected on the mammoth screen were made by two cameras, operating simultaneously and each ph-

tographing exactly half of the original scene. Fitted with special optical systems, the cameras compress the scene so that it will fit on ordinary thirty-five millimeter motion-picture film. This process, called the "hypergonar" system, does not distort the vertical view,

but "squeezes" the picture horizontally to reduce its width. After the film is made, twin projectors reverse the compressing process so that the two halves of the picture merge on the screen into one complete panorama with all parts in their regular proportions.

## Novel Car Is Air-Conditioned for Summer and Winter

**F**OUR persons sit abreast in an automobile of revolutionary design recently completed in California. Equipped with a front-wheel drive, electric gear shift, and four forward speeds, the luxurious land yacht can attain speeds in excess of 120 miles an hour. Other features of the novel automobile include complete summer and winter air-conditioning, green-tinted safety glass to reduce glare, shock absorbers adjustable through a dash control, inclosed two-passenger rumble seat, and walls lined with cork and rubber for safety.

This land yacht boasts many unusual features



A close-up view of the ultra-streamline nose reveals a striking resemblance to some strange reptile of the past

## Electrified Guitar Produces New Tremolo Effect

AN ELECTRIC guitar invented by Clayton Kaufman of Los Angeles, Calif., has a tremolo effect that can be adjusted to simulate the tonal qualities of an accordion, electric organ, or vibra harp. Plugged into an electric amplifying unit, the instrument has a selecting lever to vary its tremolo, and a pedal-operated rheostat to control its volume as reproduced through the loudspeaker.

## Chemically Treated Corn Gives Greater Yield

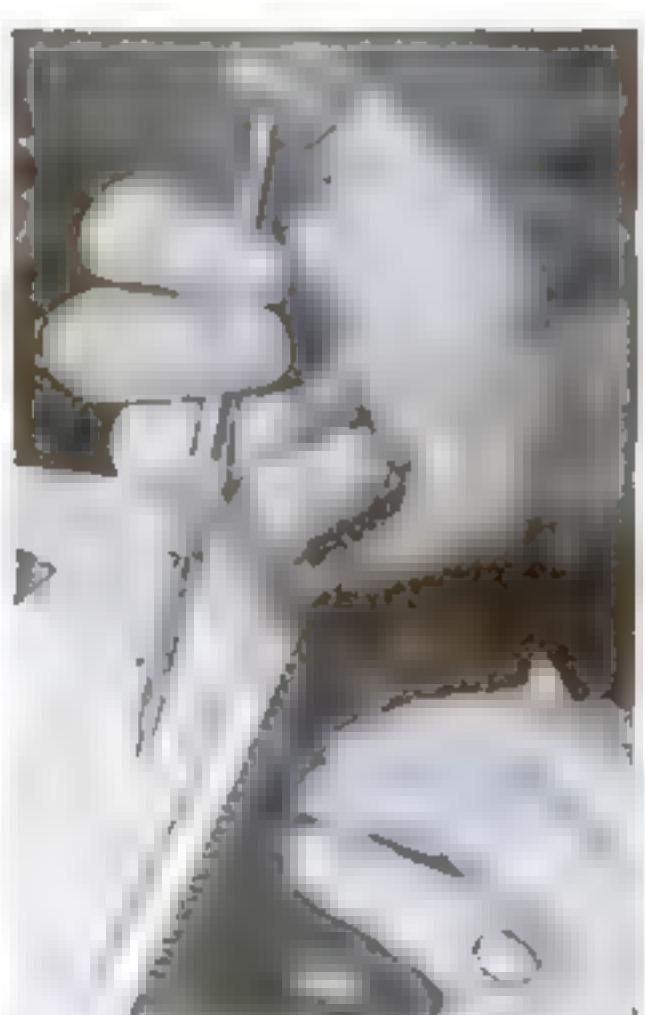


Howard D. Sallins preparing seed corn for treatment

AFTER extensive laboratory and hothouse experiments, Howard D. Sallins of Chicago, Ill., has succeeded in perfecting a chemical process for treating corn seeds, which is said not only to produce a yield higher than average, but also to insure exceptionally hardy plants that will grow under adverse conditions. In the photograph above, Sallins is shown stripping kernels from selected cobs of corn, prior to subjecting them to his special chemical treatment.

## Fountain Pen for Draftsmen Can't Clog

PRESSING a plunger on top of a new fountain pen for draftsmen causes a drop of ink to fall from a barrel reservoir down into the space between the drawing points of the instrument. Because the ink supply is replenished drop by drop at the tips, it does not cake and stop the flow while the pen is in use.



A drop of India ink falls between the drawing points when the plunger is pressed



Perry Butkin, guitarist, explaining the electric guitar to Deanna Durbin, movie star

## Double-Deck Streets Serve Dutch Homes

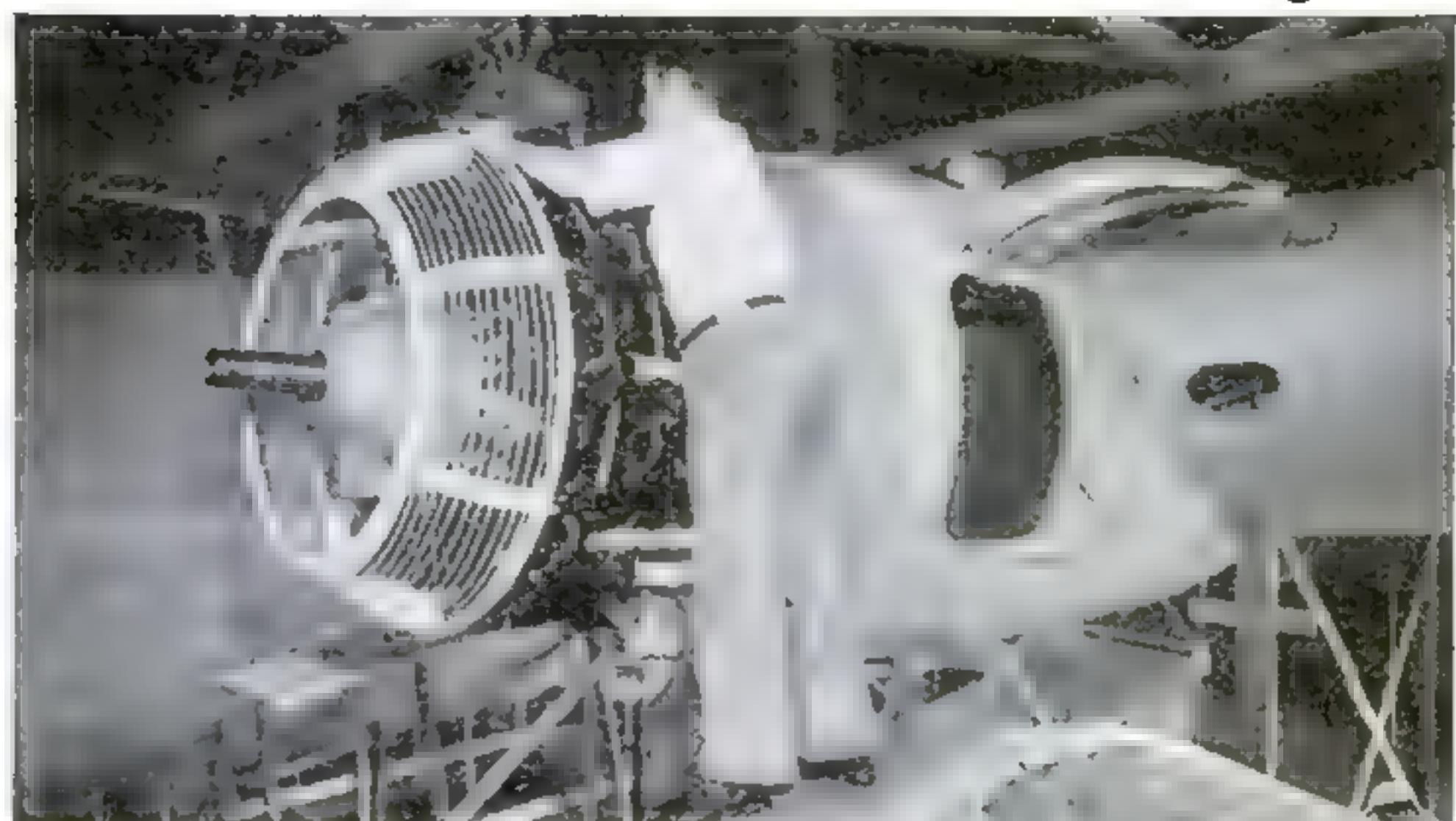


BECAUSE natives of Holland prefer individual homes to apartment-style dwellings, a new housing development in a congested section of Rotterdam is equipped with double-deck streets. Each building contains two homes, one above the other, the one at the top being served by a second-story thoroughfare as pictured at the right. Pedestrians climb stairways to reach the upper level, while cyclists and tradesmen with delivery carts ride up in elevators provided for the purpose.

A tradesman wheeling his cart off an elevator on the upper level

Below is a view of one of the upstairs streets in Rotterdam, Holland

## Full-Size Models Test New Plane Designs



This dummy craft represents a new Army bomber

### Novel Cheese Cutter Resembles a Hack Saw

RESEMBLING a hack saw, a new store fixture designed to cut large cheeses into smaller pieces for retail sale has a strong wire stretched between the ends of a hinged arm. Pushed down as shown above, the wire cleaves the cheese quickly and neatly.

### Carbon Dioxide Lamps

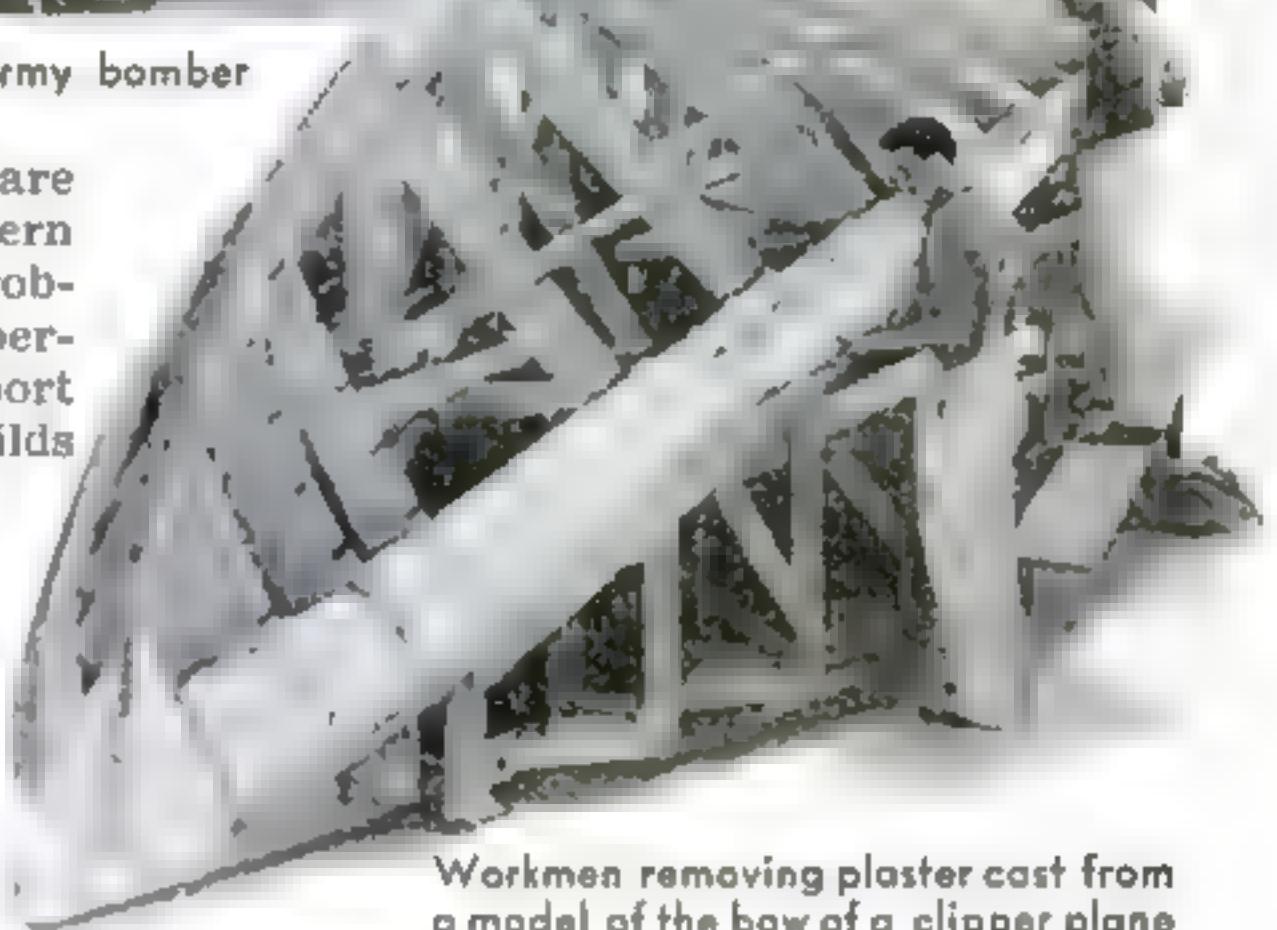
INCANDESCENT electric "daylight" lamps, filled with carbon dioxide gas, have been made practical by the discovery of a way to prevent breaking down of the gas by electric charges.



### Huge Tank Is Towed 1,371 Miles

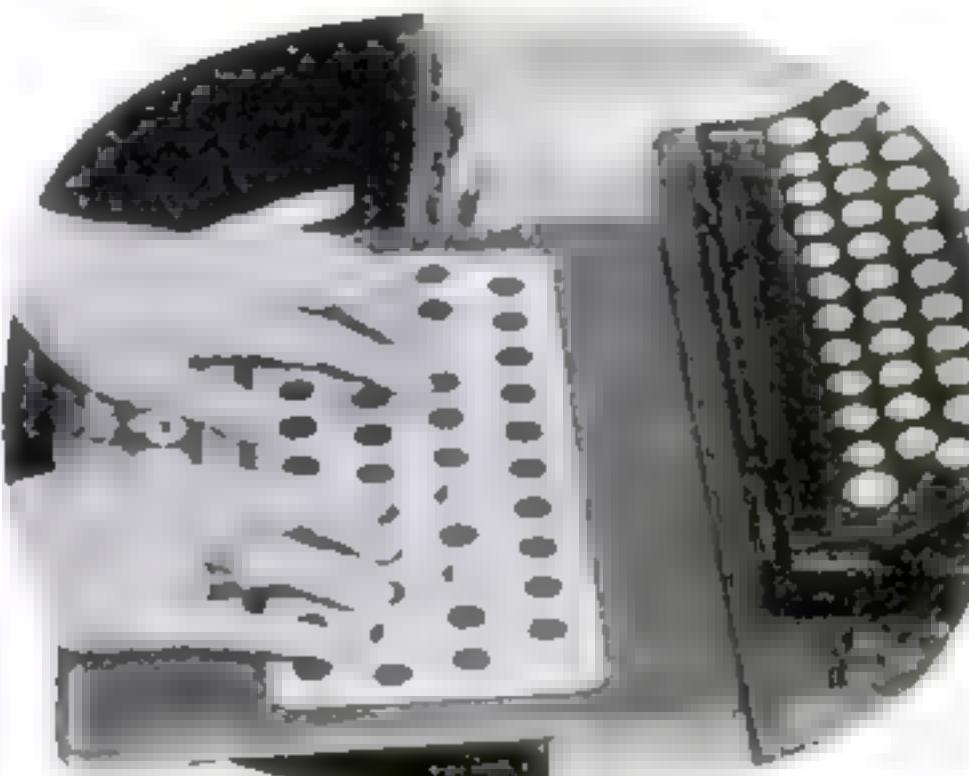
WEIGHING more than the Statue of Liberty, a mammoth steel tank manufactured near New York City is said to be the largest and heaviest piece of freight ever transported. Because it was too bulky for a railroad flat car, the eighty-foot giant was launched in the Hudson River and towed by a tug through the Erie Canal and the Great Lakes to its destination in Indiana, 1,371 miles away.

AIRPLANES that never will fly are being constructed at a western aircraft factory. To simplify problems of design, decorating, and operating huge military and transport planes, the engineering staff builds a full-size dummy plane made principally of plywood and muslin. Called "mock-ups," the dummy planes are fashioned as accurately as the finished ship to permit actual testing of proposed control locations, passenger accommodations, and other features of the plane.



Workmen removing plaster cast from a model of the bow of a clipper plane

### Odd Practice Board Teaches Touch Typing



Fingers flip shutters concealing letters

TOUCH TYPING can be practiced without a typewriter, on a novel board just placed on the market. The conventional typewriter keyboard is represented by holes covered with sliding shutters that conceal the proper letters or numerals marked underneath. The student practices by flipping the shutters instead of pressing keys, to learn their positions and the finger to use for each.

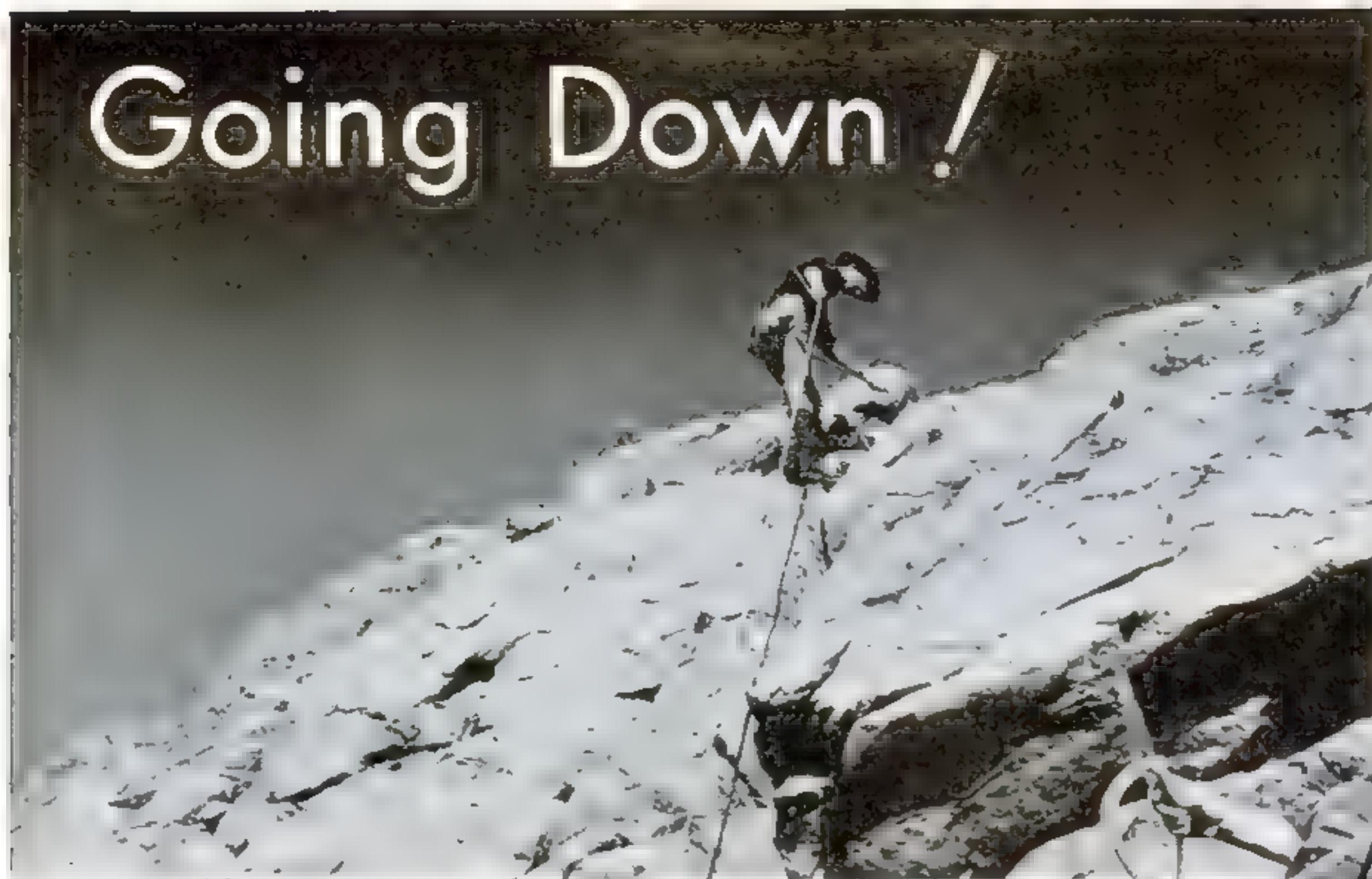
### Electric Heater Helps Start Car

FASTENED permanently to the motor, a new electric heater insures easy starting of an automobile engine in cold weather. To warm the gas mixture in the intake manifold, the unit is plugged into a convenient electric outlet by means of a connecting cord, which is detached after the motor has been started. The heater is especially designed for use in cases where cars are left in unheated garages, or in localities having very cold winters.



Heating unit clamped to manifold. A cord connects it with a handy outlet

# Going Down!



A mountaineer starting to descend a cliff by the method known as "rappelling." The rope, anchored to a support, is passed around the right leg and then over the left shoulder



## ... ALL YOU NEED IS A ROPE AND A CLIFF

FOR descending steep rock cliffs, mountaineers use a technique known as "rappelling," the various stages of which are revealed in the remarkable series of action photographs reproduced on this page. Practically amounting to controlled falling, the method employs a single

rope fastened to a convenient rock or climbing pin and wound under the climber's right leg and over his left shoulder. Pushing himself out from the face of the cliff, he lets himself drop until his feet land back against the rock. Balance is maintained with the left hand, and falling speed regulated with the right. The maneuver is repeated rapidly until the climber reaches the bottom. The last man to come down doubles the rope around the support, pulling one end to free it after he has made his descent



Starting the drop. The right hand is extended to bring up slack rope, the left arm bent. The knees are set for a quick backward spring



In the middle of the leap, as seen below, the right hand flips the rope out to keep it clear of the cliff



Swinging back against the face of the cliff, the climber checks himself. The process is repeated until the bottom has been reached

A sudden kick of the feet throws the climber out from the rock. At the same time, the right arm is bent to feed the slack rope over the shoulder, while the left preserves balance



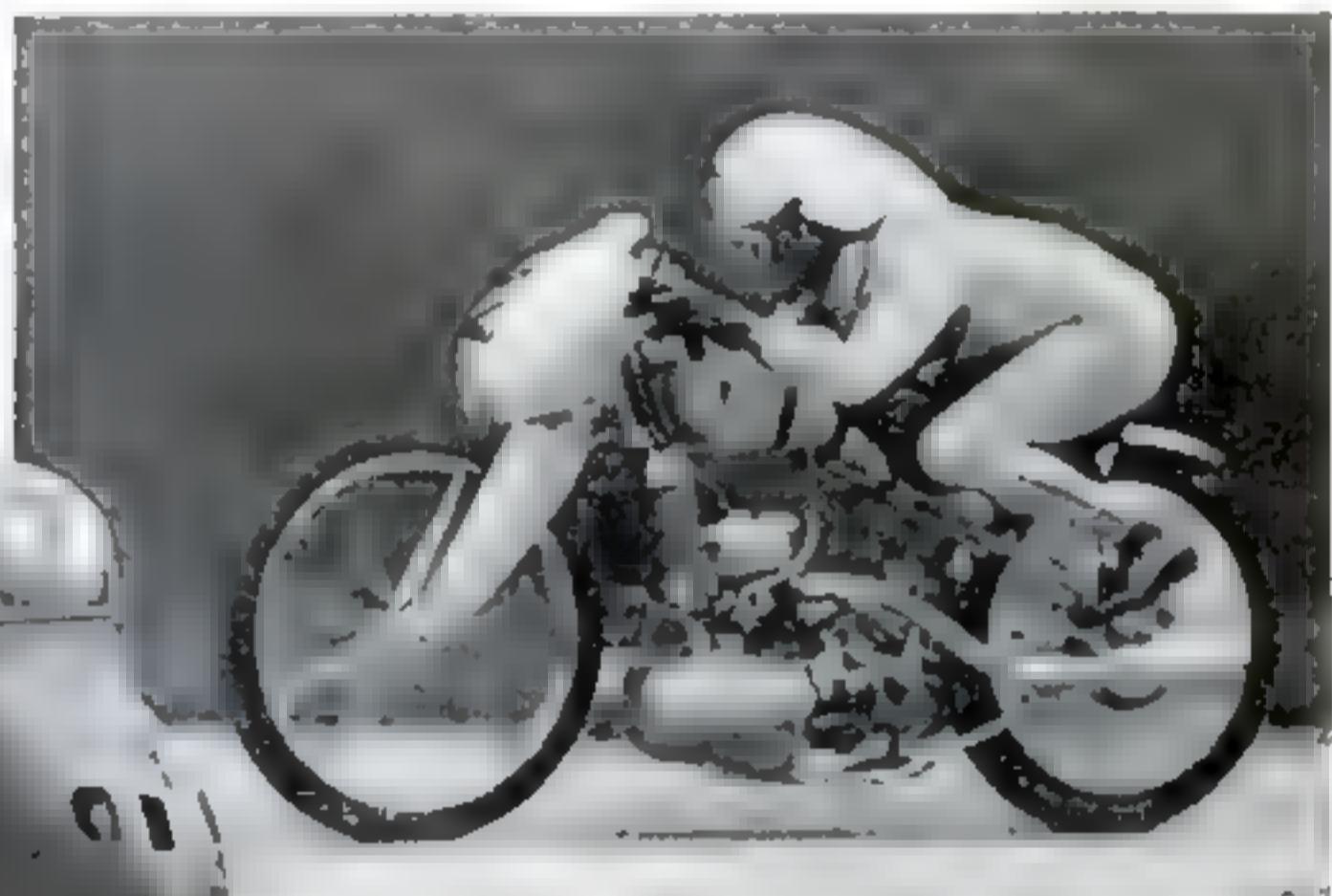
Two speedsters. The one at the left is classed as a motor cycle with a side car



Petro Taruffi, right, getting away for his 180-mile-an-hour record

## Bulletlike Motor Cycles Set New Speed Records

WITH radically streamline housings that cover the handlebars, wheels, and engines of their machines, foreign motor cyclists are setting new speed records in road races being conducted in Italy and Germany. Petro Taruffi, Italian cyclist, mounted a one-piece streamline cover fitted with a stabilizing tail fin over his machine when he recently attained a speed of 180 miles an hour, shattering the record in his class. At Frankfurt, a German racer, riding his machine like a jockey, donned a special streamline crash helmet to insure the minimum of air resistance. Features of other German racing motor cycles include teardrop exhaust vents, and lateral wheel supports that may be withdrawn at will. Record-breaking motor cycles with side cars have a highly streamline third wheel.



Ridin' like a jockey, this German racer wears a streamline helmet to reduce wind resistance

## Plumbers Use Alligators To Open Clogged Pipes

ALLIGATORS kept as specimens at the U.S. Bureau of Fisheries aquarium in Washington, D.C., are being tried out as plumber's assistants to open up clogged pipes. Placed in a length of pipe that is stopped up with silt and sediment, the reptile digs his way through, opening up a small hole which water later will widen by its pressure as it sweeps through.



An aquarium official shows how 'gators clean pipes



Sounding a horn by phone rouses hotel guests

## Odd Devices Wake Sleepers Who Scorn Alarm Clocks

TAKING the place of the traditional alarm clock, two odd methods of rousing sleepers are illustrated by the photographs above and at the right. An enterprising Englishman makes his morning rounds on a bicycle, using a pole to place an electrically operated bell against the bedroom windows of his customers. In Tennessee, a hotel telephone operator blows a hunting horn into the phone to rouse hunters.



A professional "waker-upper" and the bell he uses to ply his trade

# Straight-Shooting

**O**N A target range deep within a canyon of Elysian Park, in Los Angeles, Calif., 4,000,000 lead bullets have splattered against steel silhouettes or ploughed through paper bullseyes within the last three years. And, as a result, the police force of the nation's fifth-largest city has been transformed into a corps of expert pistol shots, every officer

prepared to take care of himself in a possible gun fight, and to get his man into the bargain.

Not long ago, for every third bandit killed on the streets or in the alleys of Los Angeles, a policeman lost his life. Now, these hard-shooting cops, 2,300

strong, get twelve bandits before gangland's guns kill an officer. Further, to prove just how good they are, Los Angeles police shooters recently swept the boards in the national pistol matches at Camp Perry, Ohio, winning five of six team contests and setting two new team records.

Shooting ahead, abeam, and behind from moving automobiles; firing with right hand and left hand while advancing, retreating, hiding behind trees and fire plugs, and lying prone on the earth; picking out heads in tiny windows of cardboard houses; climbing mountains, sliding down rocky canyons, crawling up slippery, grassy slopes; mastering boxing, wrestling, jiu-jitsu—the new crop of cops learns to beat any criminal to the draw, disarm a thug before he can pull the trigger, and subdue the strongest adversary. The "gun slingers" and bad men of the frontier four decades ago would be no match for these masters of firearms and physical tricks.

Take the case of Patrolman Sam Posner, for instance. Posner, a recent graduate of the Los Angeles Police Training School, picked up a felony suspect the other night—a burly fellow who swore that no cop would take him to headquarters. When the officer's partner left the car a moment, the prisoner turned on Posner in a mad effort to knock him out and escape. But the officer clamped a headlock on the attacker and quickly subdued him. When his fellow officer returned, he was quietly sitting on the prisoner.

Or Officer L. A. White, who questioned the driver of a car double-parked

Chief James E. Davis with the Los Angeles police team that won the national field-firing championship



Cartridges used in practice are reloaded. Here newly cast bullets are being sized and greased



One of the ranges on which Los Angeles policemen are turned into expert pistol shots. Different exercises are used to simulate conditions of actual police work



# Cops TRAINED ON NOVEL PISTOL RANGE

By  
ROBERT E.  
MARTIN

on a downtown street the other night. While he was investigating the car, one of its four occupants stuck a gun in White's ribs. With one movement, the officer struck the gun aside, grasped the man's wrist with both hands, and pointed the muzzle toward the assailant's chest. Not only did this speedy counterattack possibly save his life, but it brought the four men to book on sixteen felony counts, including possession of the crime-breeding drug marijuana.

The development of fast-shooting officers in Los Angeles goes back to a day in 1925, when R. Lee Heath, then chief of the department, met a newspaper reporter at a soda fountain near Central Police Station and offered to buy him a drink. The reporter, in reaching for a straw, knocked over a glass. Heath jumped away, and the reporter caught a glimpse of a miniature cannon on his left hip.

"It's a .45, the best I can get," was the way Chief Heath satisfied his guest's curiosity about the weapon. "You know, the larger the bullet, the greater the shocking power."

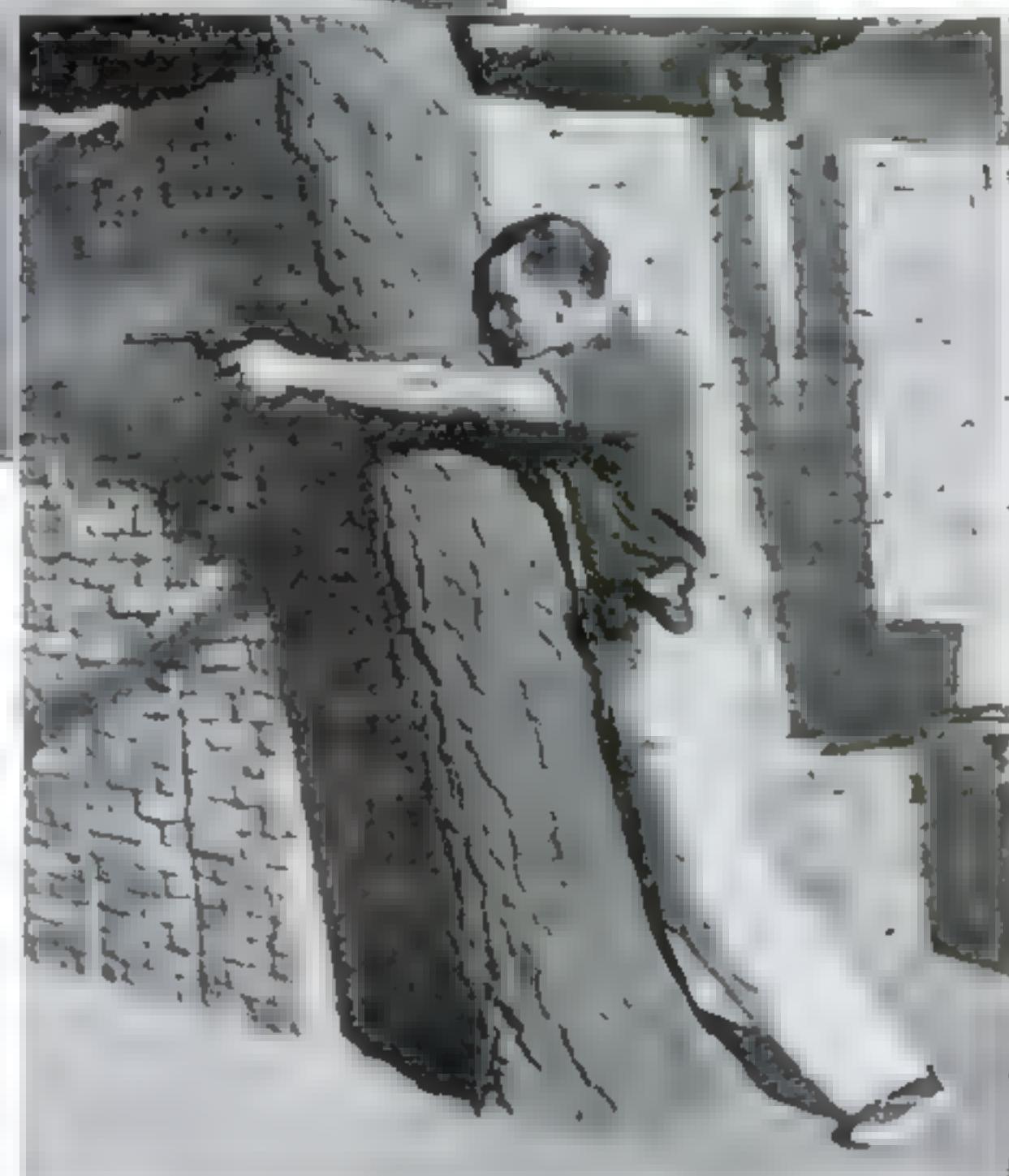
"Why don't all officers

carry .45's," the reporter queried, "if they're the most effective?"

The chief investigated, and found his officers carrying everything from tiny .25 caliber automatics to large, single-action frontier-model Colts. Soon he had planned a system of training and ordered all officers to adopt .45 caliber revolvers. When

*(Continued on page 120)*

On this range, a rookie fires while advancing on five silhouette targets. He must learn to hit all five with five bullets. Below, another student officer is shooting from behind a tree at figures appearing in the windows of some cardboard houses



Below, a sergeant is operating levers that make dummies bob up and down to simulate snipers in the range called "Hogan's Alley"



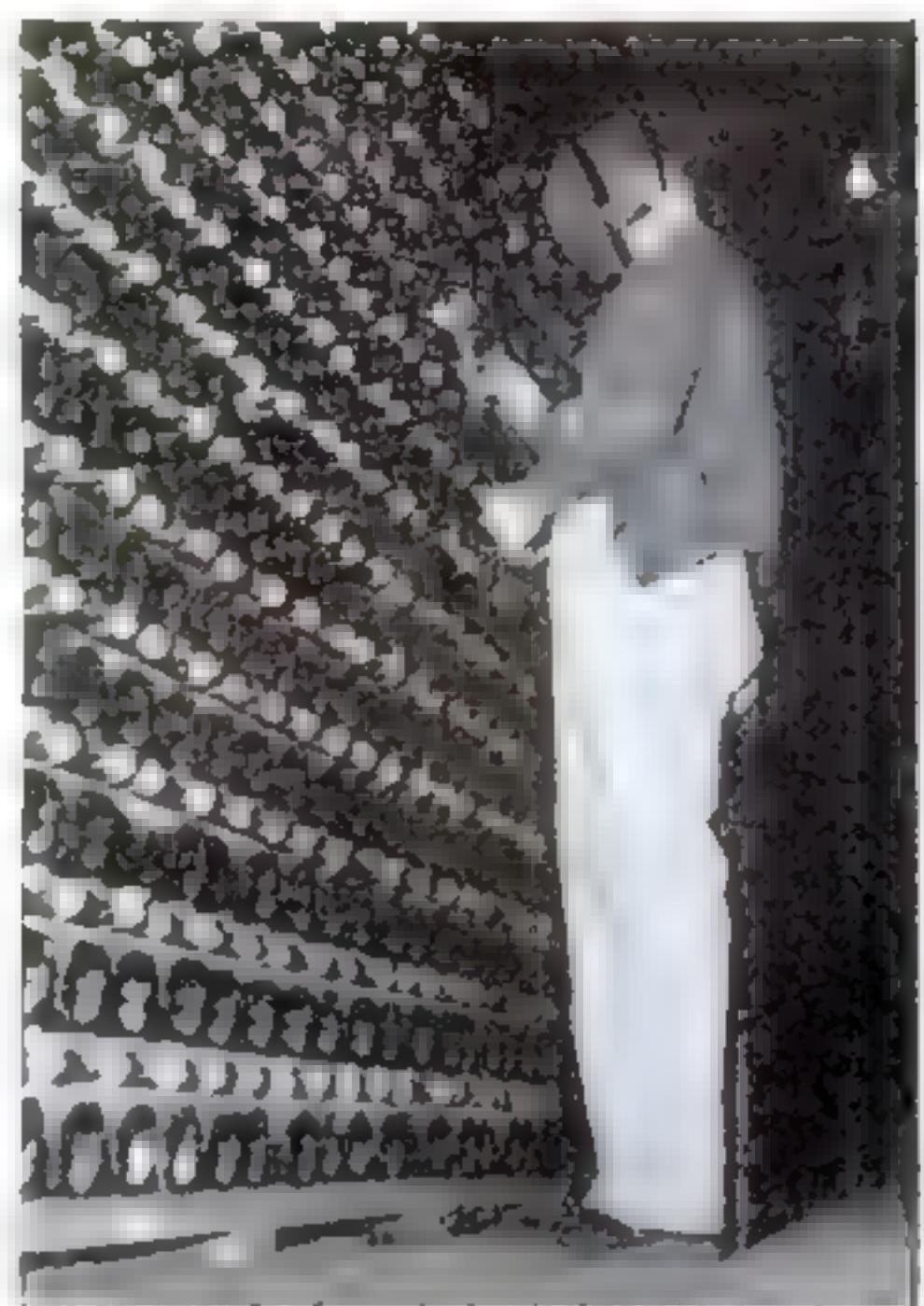
Instructor John Dillon showing a group of recruits how to disarm an assailant approaching from the front with a gun

## New Car Top Is Easy to Raise



One hand is all that is needed to raise the top on this car

RAISED or lowered with exceptional ease, a new rattleproof, waterproof top is a feature of some models of a low-priced Italian car now on the American market. Designed to give more than forty-five miles to a gallon of gasoline, the lightweight car has an all-metal body, independent front-wheel suspension, hydraulic brakes, and syncro-mesh transmission. A convertible cabriolet model is pictured at the left.



## Portable Photo Lamp "Stops" Moving Objects



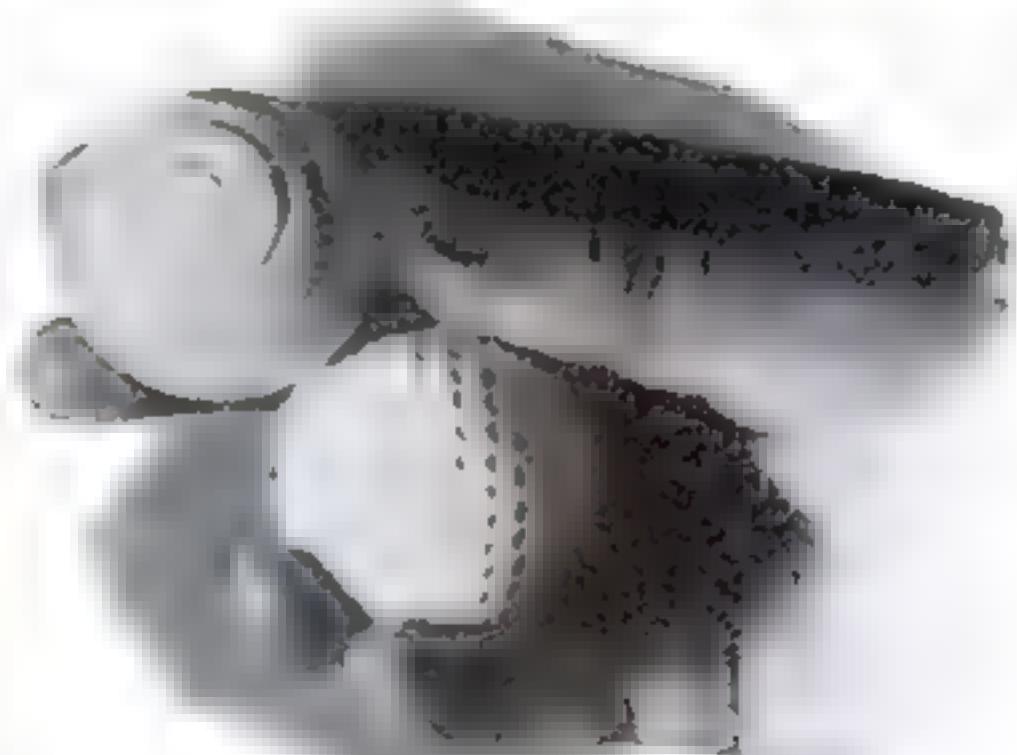
TO FACILITATE the photographing of rapidly moving objects, two scientists at the Massachusetts Institute of Technology, Cambridge, Mass., have just developed an ultra-high-speed flash lamp that is portable. Designed to supplement the present elaborate system of high-speed lamps set up in the laboratory, the unit can be easily moved and plugged into a convenient power supply. The gas-filled bulb is capable of flashing a light at intervals as short as 1/1,500,000 of a second. The accompanying photographs show how the lamp is able to "stop" the whirling blades of an electric fan as it draws in the smoke from a burning wand.



Experimenters using the new lamps to photograph a wisp of smoke being sucked into an electric fan. The inset shows the resulting picture, with the whirling fan blades "frozen"

## Fencing Masks Shield Wine Testers' Faces

FENCING MASKS give protection to wine testers in the storage cellars of a California vineyard. In the photograph above, a vineyard employee is checking the pressure built up within the bottles by the fermentation of the wine. Masks are worn because corks occasionally are blown out with great force during the pressure-testing operation.



## Air-Conditioned Ball Improves Golf Shots

EIGHT circular grooves cut into the covering of a new golf ball make it rotate smoothly without creating undesirable air currents, according to its inventor, John R. Farrar, of Cleveland, Ohio. This is said to reduce the amount of hook or slice when the ball is hit.

## The Man



### with the Net

BURNING COAL has released 180,000,-000,000 tons of carbon dioxide gas into the atmosphere during the last fifty years.

VODKA is an important ingredient in synthetic rubber now being made in Russia.



ONLY FOUR of the 12,000 known kinds of bees gather honey.

THIRTY MILLION books have been published since Johannes Gutenberg introduced printing in the fifteenth century.

JAZZ MUSIC has been used to kill silk-worm parasites in Japan.



SOUND travels faster through red vulcanized rubber than through black vulcanized rubber.

SNAKES which are born inside eggs are provided with a temporary tooth for piercing the shell.

CHIMPANZEES, as well as humans, can become drug addicts.



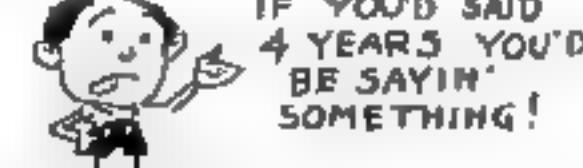
CINNAMON trees once grew in Texas.

BEEs employ twenty-two different muscles when they use their stings.

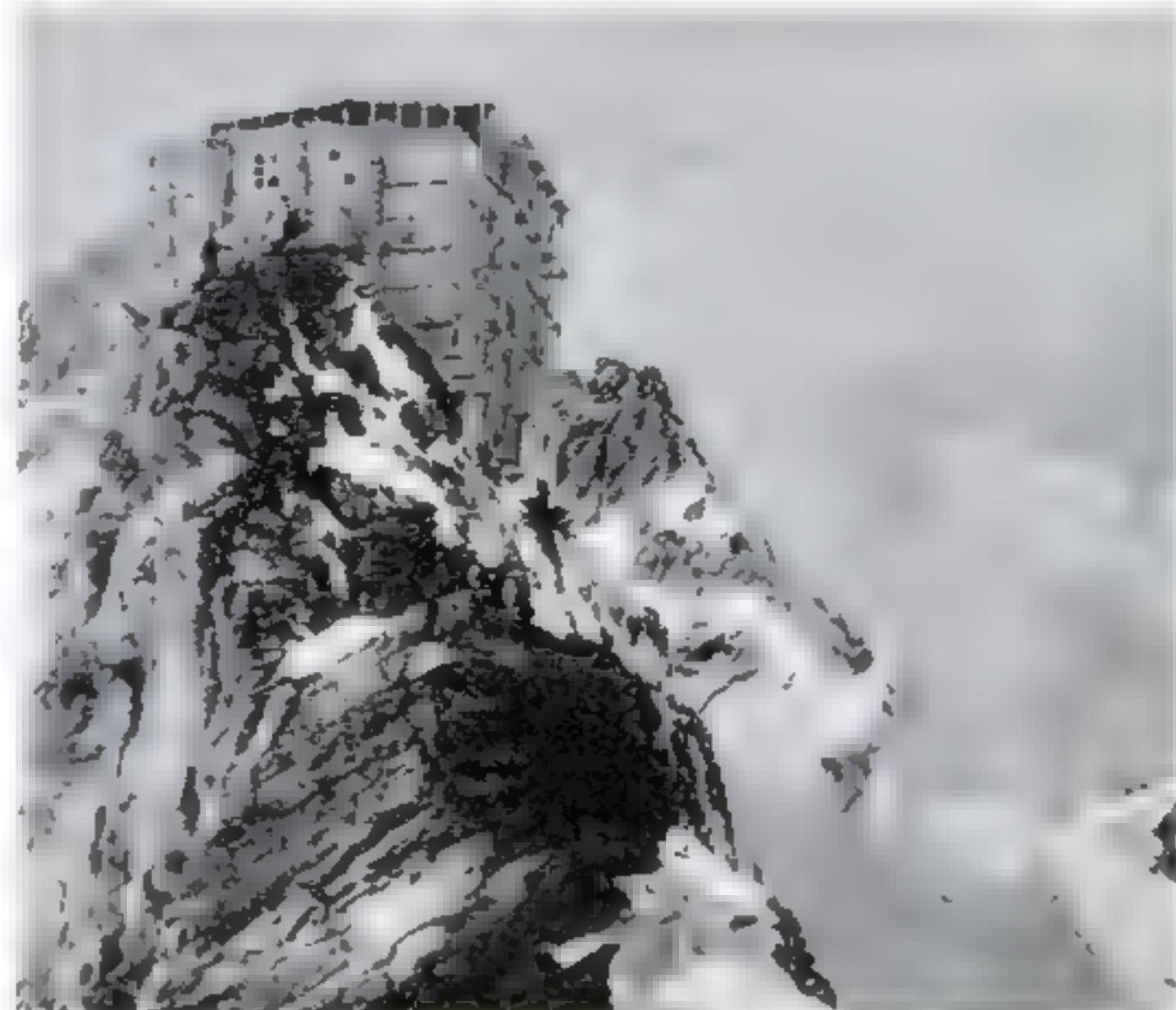
BOMBS with synthetic-resin shells have been invented by two American scientists.

PRESENT-DAY cows give enough milk to feed ten calves each.

CHILDREN born in March live on an average four months longer than those born in July.



## Weather Station Caps Alpine Peak



Weather observatory under construction on a 12,000-foot mountain

PERCHED on the rocky peak of a 12,000-foot mountain in the Swiss Alps, the loftiest research station on the continent of Europe is now nearing completion. Scientists will soon move into the wind-swept laboratory to begin a year-around meteorological study of winds, temperatures, and general atmospheric conditions at high altitudes in an effort to improve the accuracy of weather forecasting. The Alpine laboratory is pictured with its wooden scaffolding still in place.

## Removable Soles Keep Spikes Off Floors

DETACHABLE outer soles have been invented for use with spiked shoes worn by runners, golfers, and other athletes. Strapped over the sport shoe, the soles have wear-resisting bottom surfaces and soft, rubber tops into which spikes or sharp cleats will sink. The outer soles make it unnecessary to change from spiked to ordinary shoes when walking over floors, sidewalks, and other surfaces that might easily be damaged by the spikes.

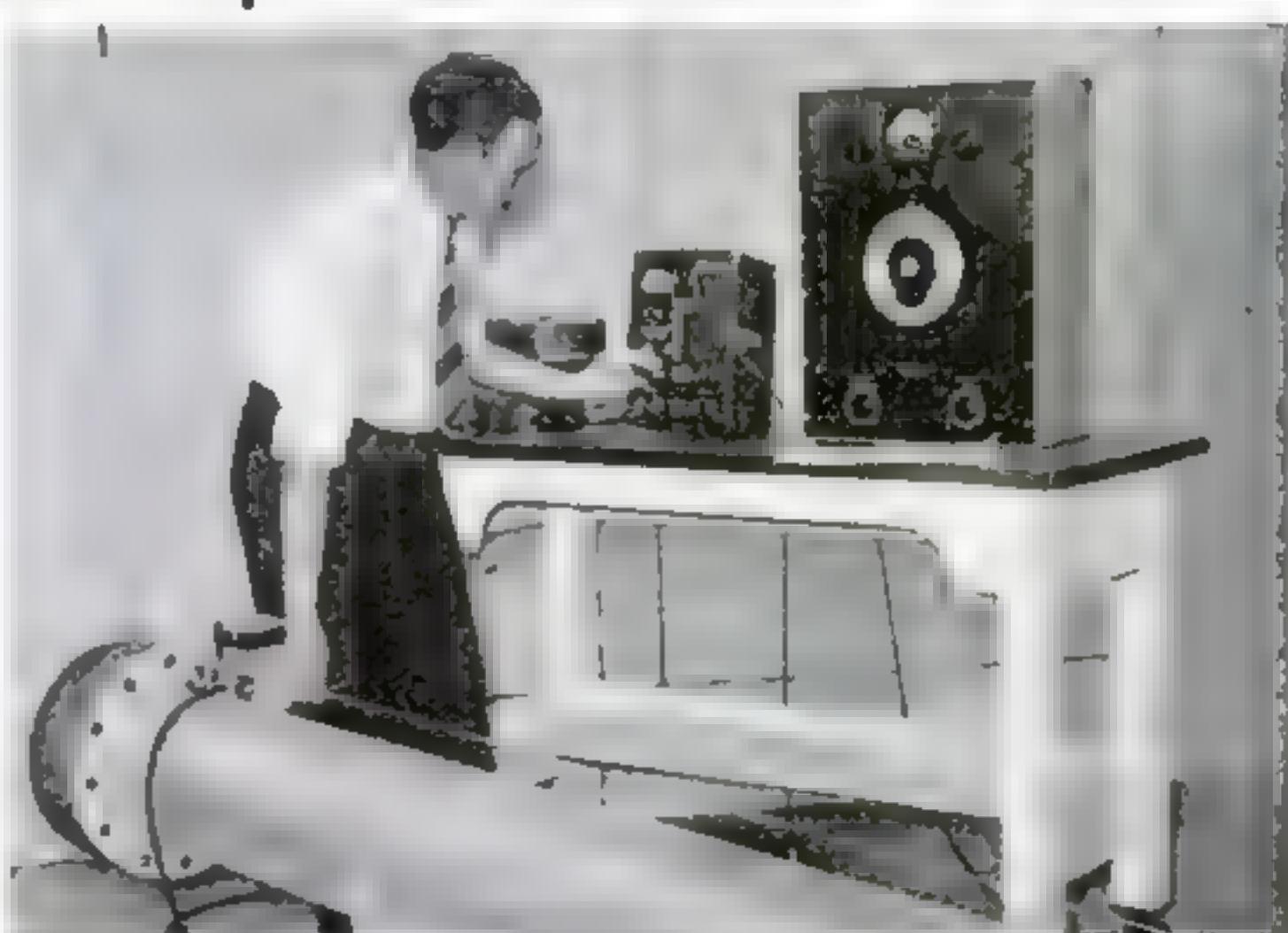


## Hen Mask Ends Pecking

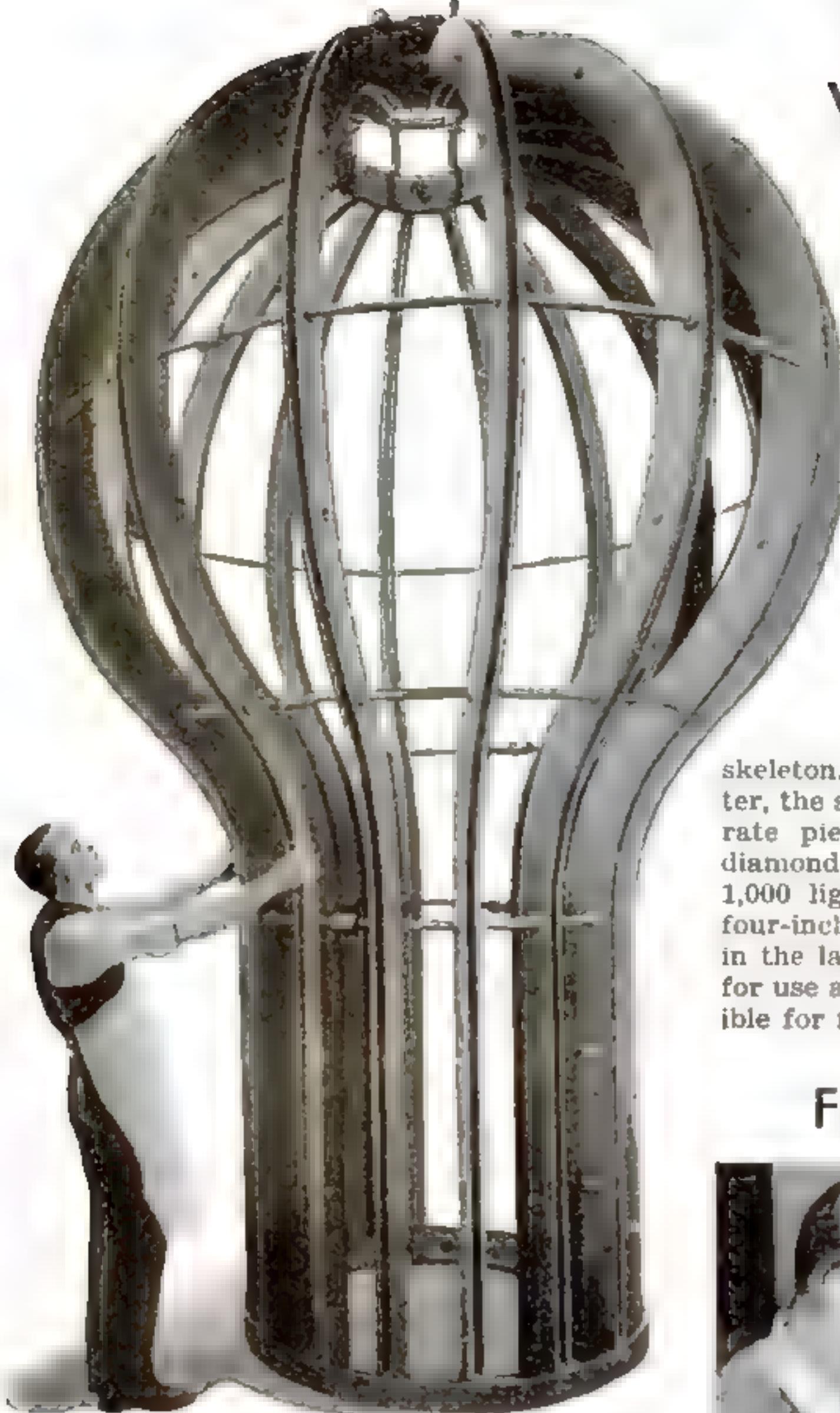
ODD BLINDERS, invented by J. C. Cridlebaugh, California poultryman, prevent hens from pecking the feathers of other hens. A metal strip clamped over the beak, as pictured above, blocks the hen's forward view to discourage the habit.

## Noise Meter Helps Test Materials for Cars

MATERIALS that dampen excessive sound and absorb vibration noises, for use in automobiles, are tested with the novel apparatus shown at the right. Sound waves sent through a ten-inch pipe strike the test material at the other end. A noise meter measures the volume and intensity of the sound that is reflected back from the material, to indicate its noise-absorbing qualities.



Sound reflected in the pipe by test materials is recorded on dials



The steel skeleton that supports the three tons of amber-tinted glass to form the unique beacon

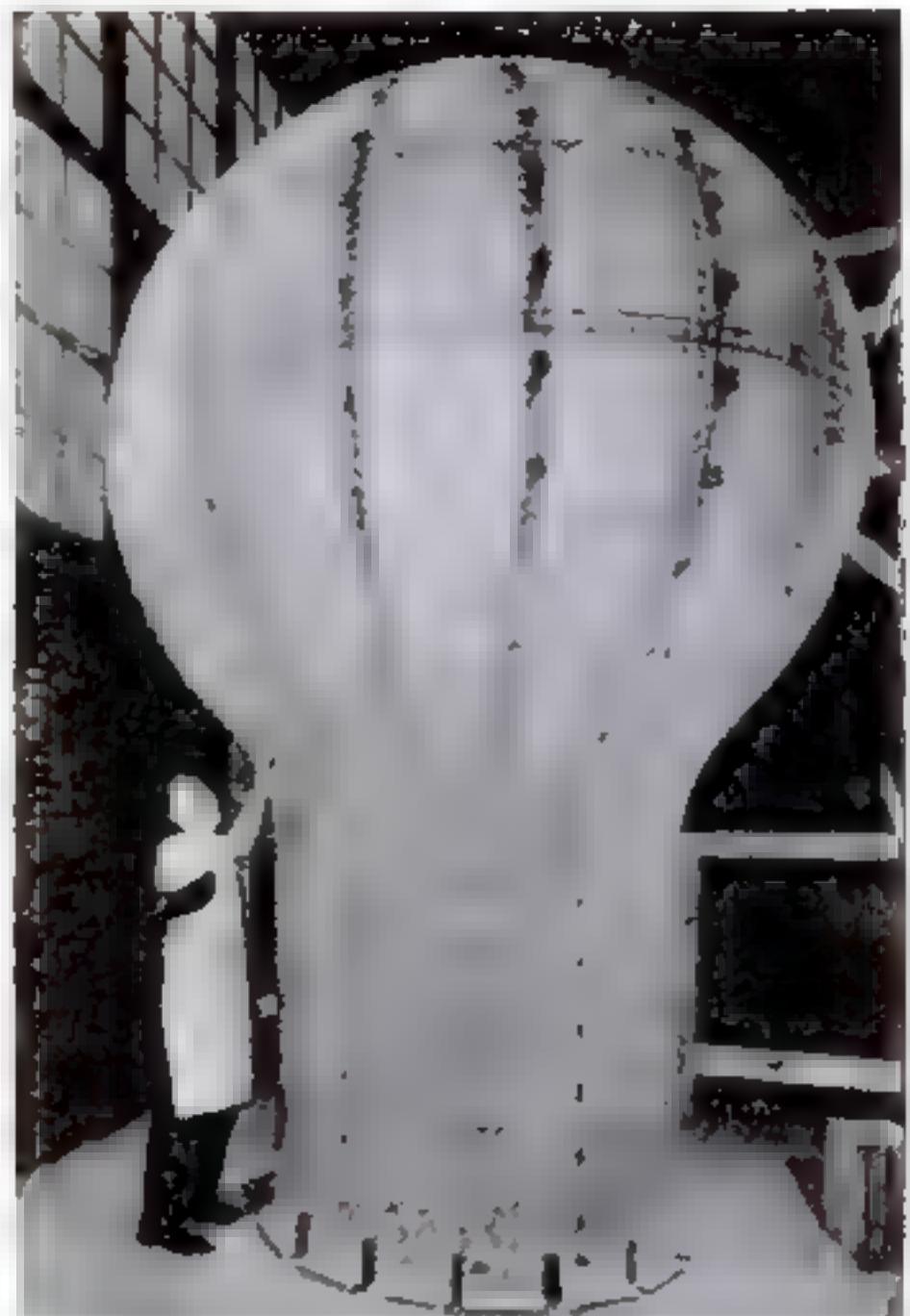


### Vacuum Cleaner for Faces Removes Skin Blemishes

A VACUUM machine just invented for use in beauty parlors is said to be effective in eliminating blackheads, pimples, enlarged pores, and other facial blemishes. Connected to a vacuum pump by means of a length of rubber hose, a specially shaped metal tip is applied to the face directly over the blemish, as shown in the photograph above.

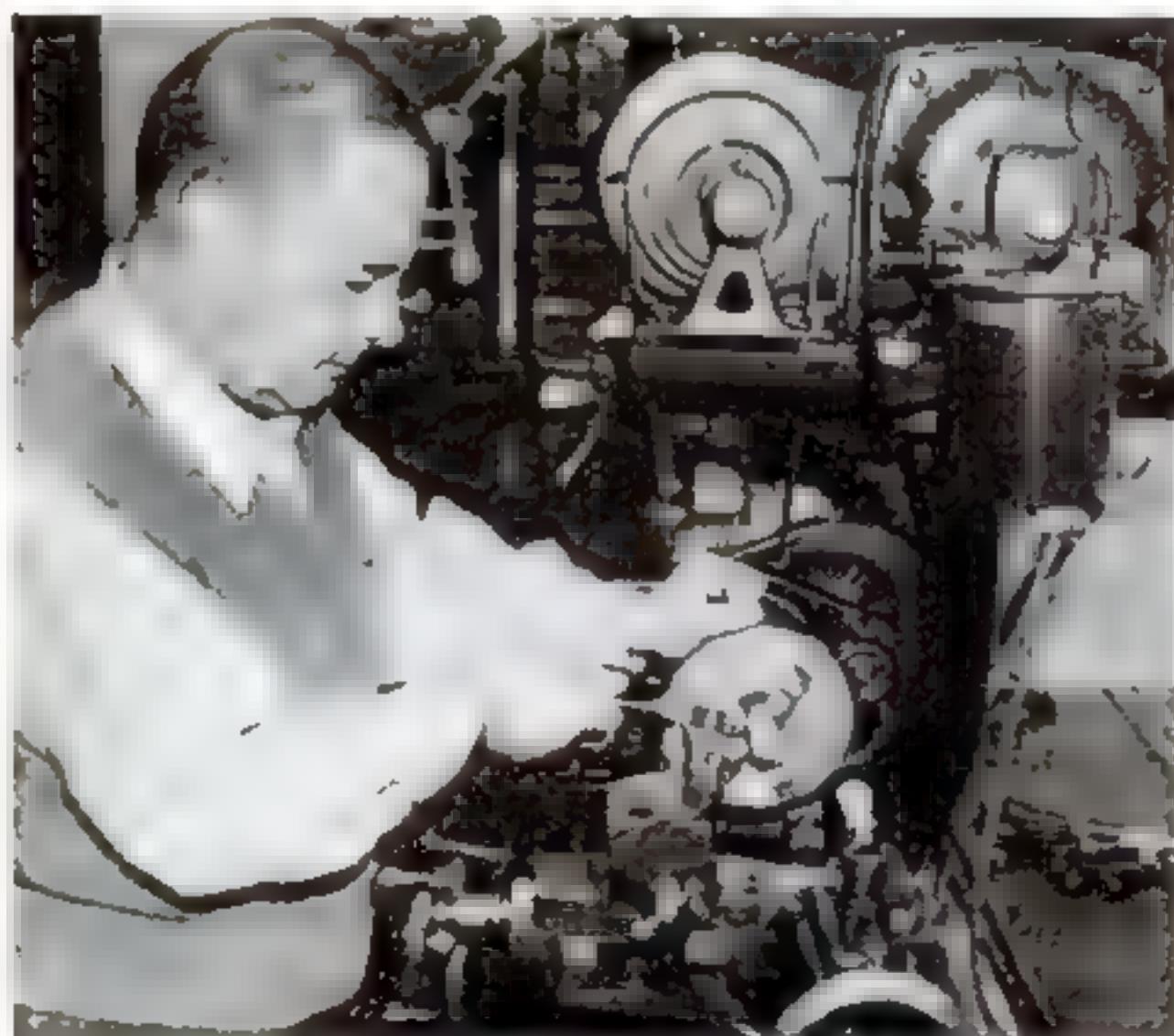
## Gigantic Electric-Light Bulb Will Crown Edison Memorial

TOWERING more than fourteen feet high, a giant representation of an electric-light bulb just completed after eight months of work will be mounted on top of a memorial tower at Menlo Park, N.J., to commemorate Edison's invention of the incandescent lamp. In making the mammoth light, more than 6,000 pounds of amber-tinted glass was fitted over a steel skeleton. Over nine feet in diameter, the six-ton bulb has 164 separate pieces of glass cast in a diamond surface pattern. Nearly 1,000 light bulbs and a twenty-four-inch reflector arranged within the lamp will fit the memorial for use as an airplane beacon visible for many miles.



Lighted by 960 real incandescent bulbs, this mammoth globe will guide aviators

### Famous Pianist Is Also an Inventor



Josef Hofmann at work in his cellar shop near Philadelphia

JOSEF HOFMANN, who is almost as famous for his inventions as for his skill at the piano keyboard, has added another to his long list of practical discoveries. In the complete machine shop that he has set up in the basement of his home near Philadelphia, Pa., he recently perfected a device that improves the mechanical action of pianos. Many of his patents are far removed from music, and include improved steering mechanisms for automobiles.

### Candy-Coated Tongue Sticks Tickle Youthful Palates



Note the willingness with which this young patient is examined

PHYSICIANS should have little trouble in examining the throats of their young patients when they use new tongue-depressing sticks that are coated with candy. The wooden tongue sticks, one of which is pictured at the left, are coated with a harmless sugar concoction that appeals to the taste of the majority of children.

# Baby Chicks Shipped on Airliners



## Stencil for Lipstick

LIPSTICK is applied quickly and evenly with the aid of a stencil just invented. The stencil is adjusted and held over the mouth as shown in the photograph above, thus insuring correct shape and unblurred edges when the lipstick is rubbed on.

## Ash Tray Dumps Butts

WHEN a cigarette, placed on the holder of a novel ash tray, burns down to a certain point, it is automatically dumped into the body of the tray. Heat from the cigarette releases a spring that raises the holder as pictured in the illustration below.



Heat from the cigarette makes the holder tip



Cartons of baby chicks being loaded into the tail of a clipper plane

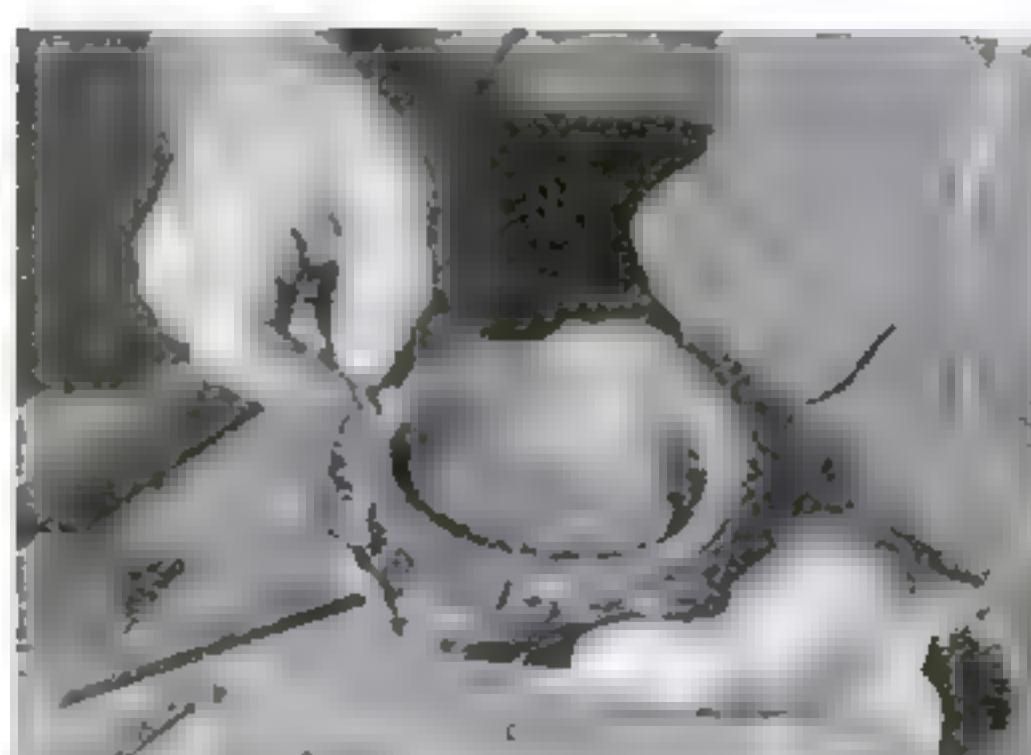
A view of the chicken storage and, right, seventy-five chicks ready for shipment

PACKED in specially designed, ventilated cartons, thousands of newly hatched baby chicks every week make the long trip from the United States to Central and South America in the tails of Pan American Airways clipper ships. Intended to replace tough native fowls on Latin American tables, the chicks

are lighter than eggs for hatching, and since they do not eat for the first seventy-two hours of life, there is no feeding problem. More than 500,000 chicks were transported in this way during the last twelve months.

## Miner Makes Art Objects Out of Hard Coal

MAKING decorative novelties from lumps of coal is the unusual hobby of Guido Larizzio, Nesquehoning, Pa., miner. Protecting his eyes with goggles made of fine wire screening, Larizzio chips out ash trays, lamps, mantel ornaments, and other art objects in his leisure time. No special instruments are employed in the work, the common tools including a hammer, chisel, cuticle knife, nail, rasp, and double-edge razor blade. At the right, the hobbyist is shown using his crude tools to make ash trays from a large lump of anthracite coal.



Guido Larizzio finishing an ash tray chipped from a large lump of anthracite coal as pictured at the right



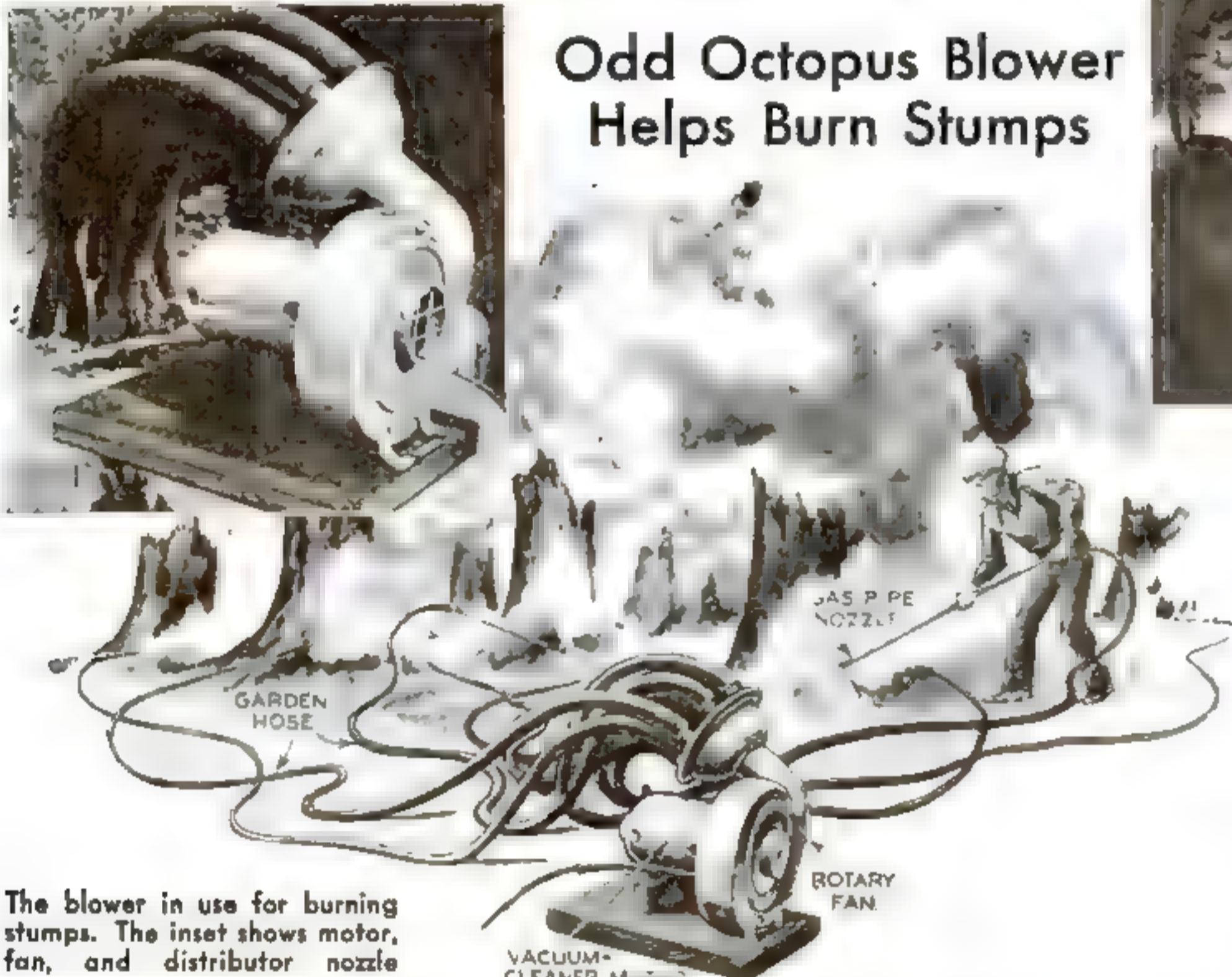
# Twin-Motored Plane Flies 250 Miles on One Engine



With only one motor running, this plane held an average speed of 125 miles an hour

TO DEMONSTRATE its ability to maintain flight with only one engine operating, a new eight-passenger, twin-motored transport plane recently made a round-trip test flight between New York and Philadelphia. After the take-off with both motors operating, the ignition switch of one engine was cut off and a special brake was applied to stop its propeller from turning. The plane flew a total distance of 250 miles at an average speed of 125 miles an hour, and returned to the airport to land with one engine still out of operation. On the test flight, the plane carried five passengers and 160 gallons of gasoline

## Odd Octopus Blower Helps Burn Stumps



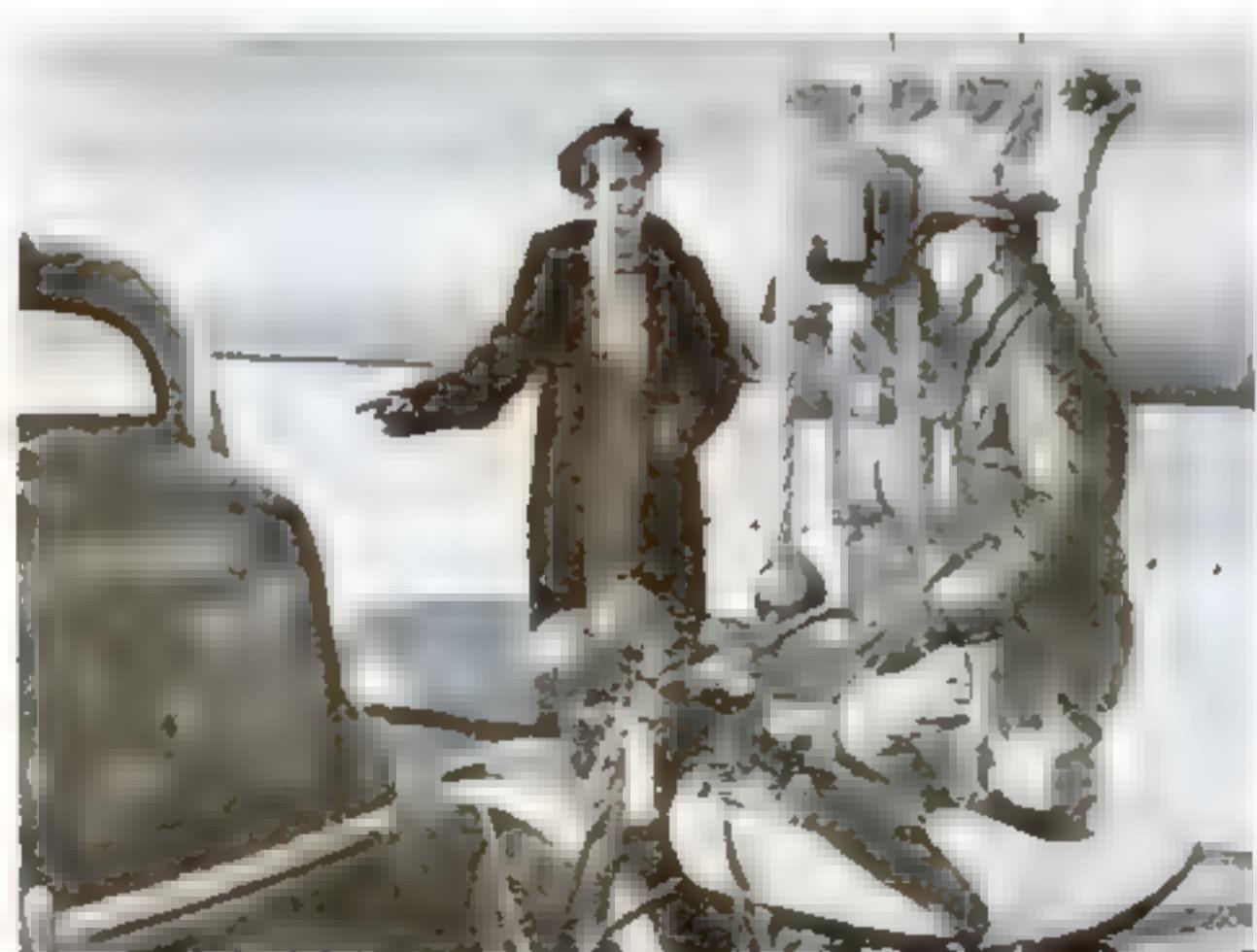
The blower in use for burning stumps. The inset shows motor, fan, and distributor nozzle

TO SUPPLY a forced draft for burning a number of tree stumps, Cecil Solly, of Seattle, Wash., devised the odd octopus blower pictured above. An electrically operated fan blows air into a

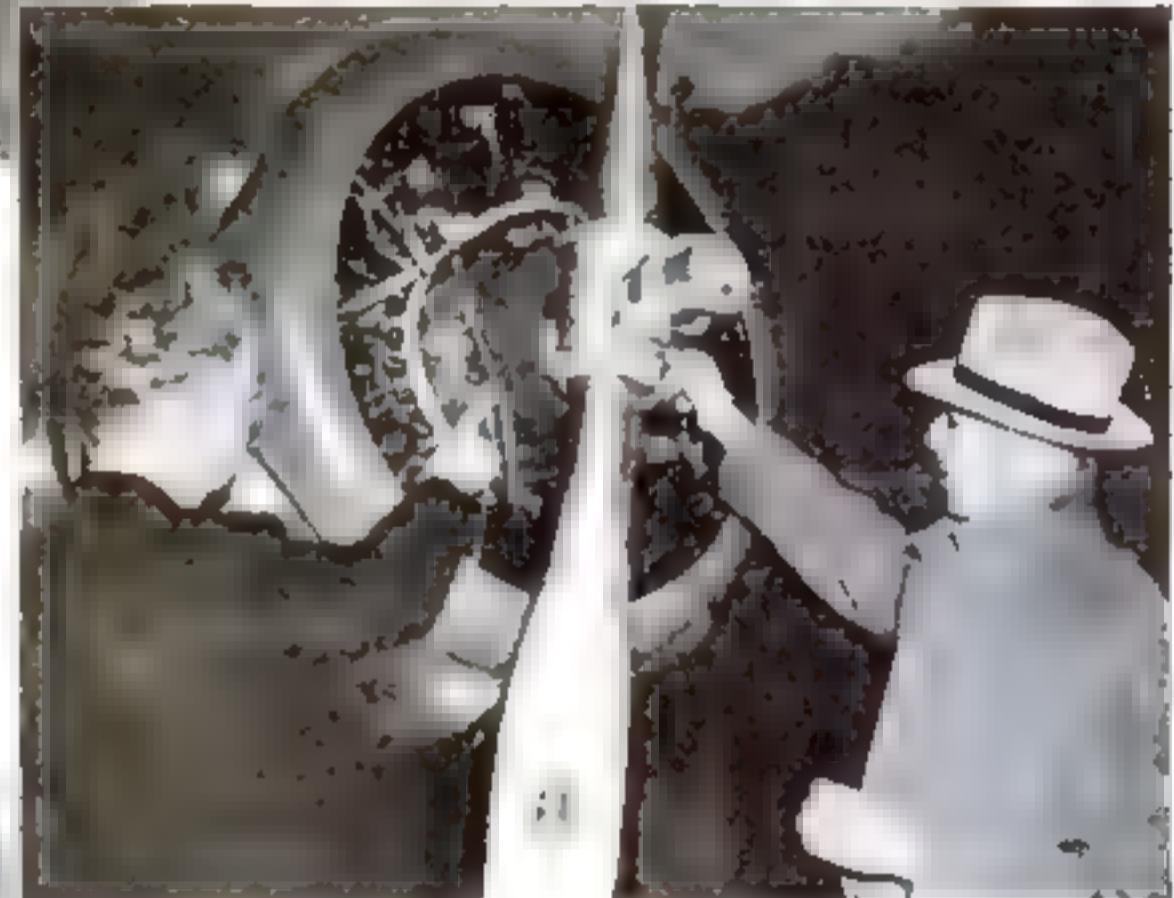
special nozzle that distributes it to a number of rubber hoses. The latter are fitted with metal ends that are placed at the stump bases to fan the fires as shown in the drawing above.

## Bridge Alarm Box Calls Tow Car

MOTORISTS who have car trouble while crossing the San Francisco-Oakland Bay Bridge can summon aid by operating one of the alarm boxes that are placed at frequent intervals along the span. Colored red, the boxes contain two alarm dials, one for fire and the other for tow-car service. Tow cars that answer alarms carry emergency first-aid equipment in addition to gasoline and towing apparatus.



A motorist waiting for help after a breakdown on the bridge



A specially constructed brake, seen above, stopped one propeller after the take-off



## Rope Ladder for Ships Has Nontilt Steps

DESIGNED for use by harbor pilots in boarding vessels, a new type of Jacob's ladder has steps provided with end pieces that rest firmly against the ship's side to prevent tipping and afford safe, rigid footholds. The new ladder is seen at the right in the photograph above, in contrast with one of the conventional type now in general use.



## Motor-Driven Car Carries Machine-Gun Crew in Action

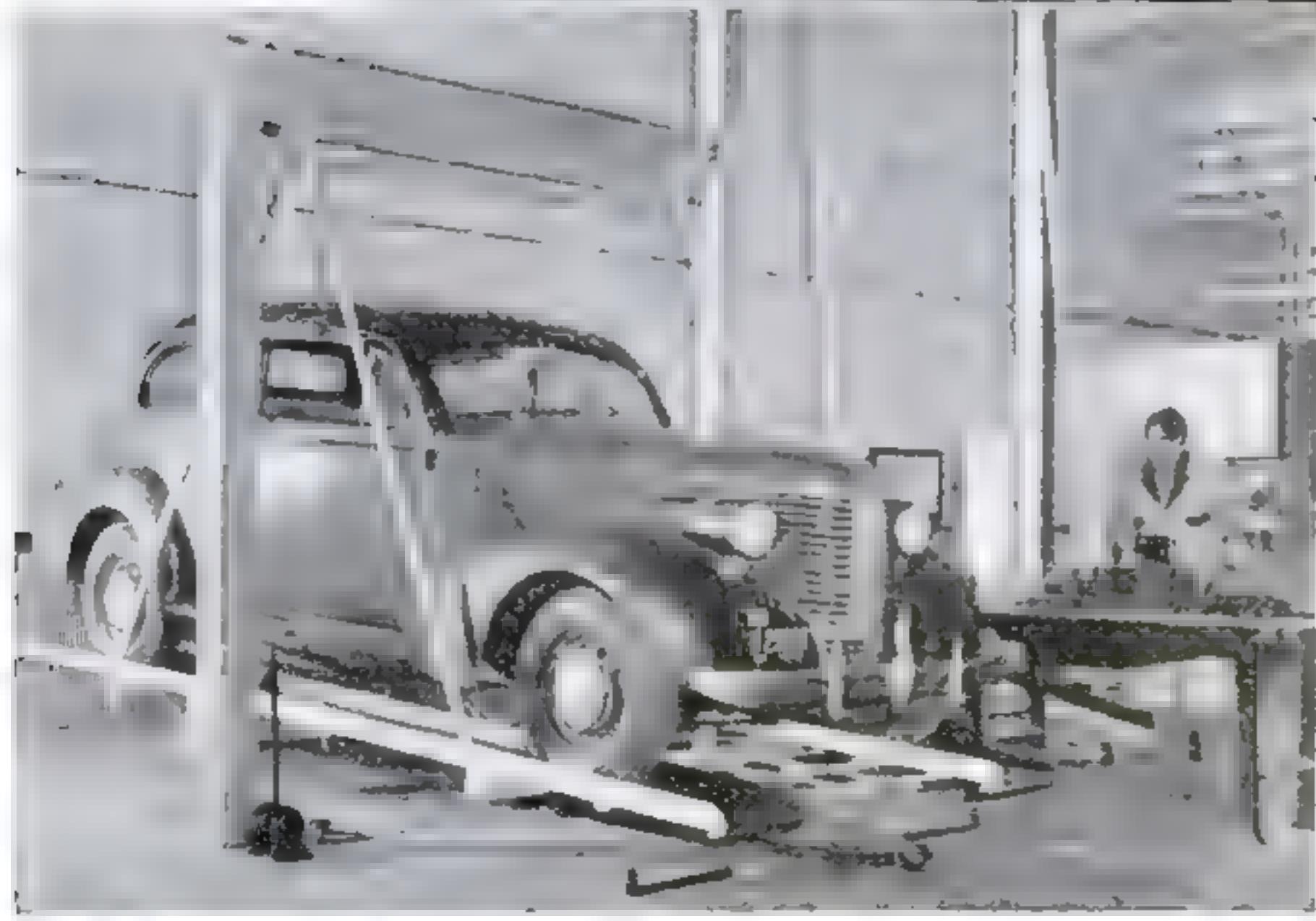
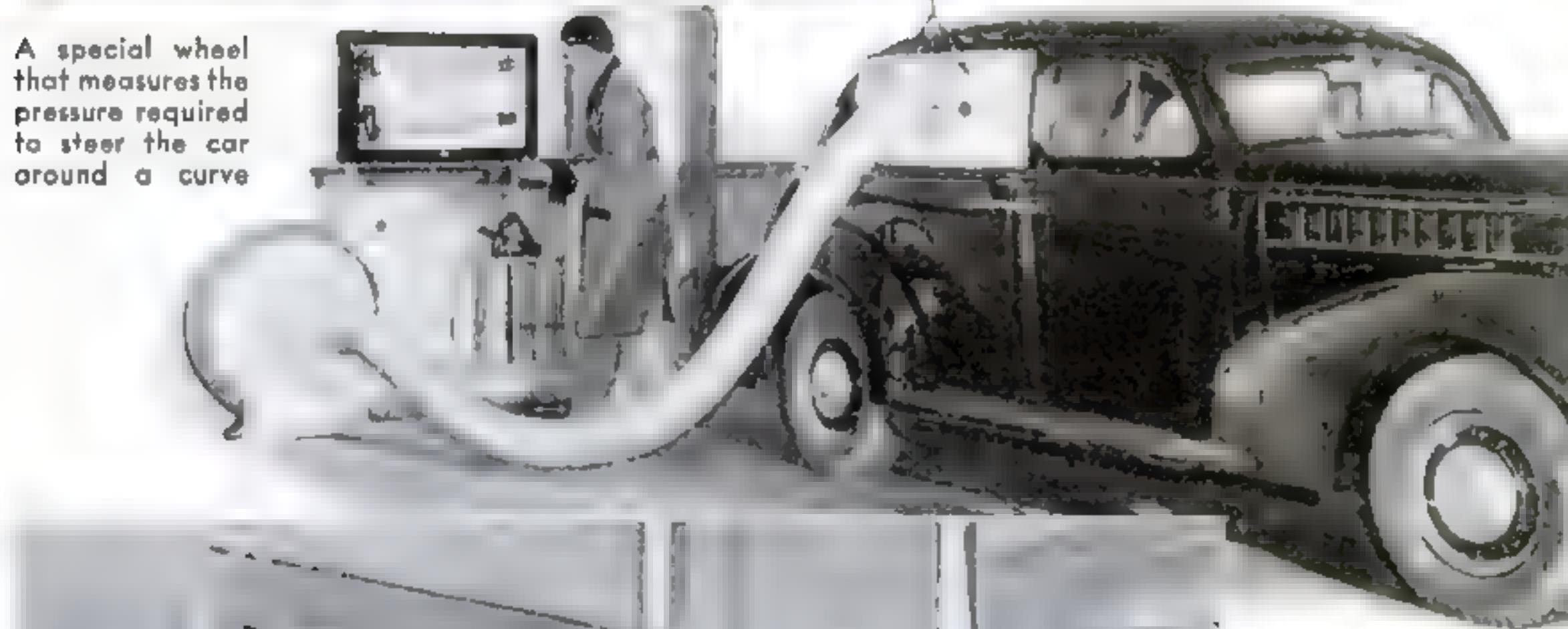
LOW-SLUNG and fitted with four diminutive wheels, a novel vehicle undergoing tests by U. S. Army officials is designed to serve as a mobile machine-gun carrier to enable gunners to fire con-

tinuously during an advance or retreat. Manned by two soldiers, the curious machine is powered by a gasoline motor geared to the rear wheels. While one man operates the gun, the other con-

trols the speed and direction of the vehicle by means of special pedals operated by his feet. At the same time, the steerman assists the gunner by feeding racks of cartridges into the gun.



A special wheel that measures the pressure required to steer the car around a curve



A car in the large pendulum apparatus that determines its exact center of gravity

## Automobiles Get Odd Tests for Comfort and Efficiency

CONDUCTING a continuous search for new improvements and refinements that will contribute to greater ease, efficiency, and comfort in automobile operation, automotive engineers have developed a number of improved methods of testing stock cars at proving-ground laboratories. In one of these tests, a powerful suction pump draws out the air within a closed car by means of a flexible hose that is sealed over one of the car windows. This is designed to check the body for possible air leaks around doors, windows, windshield, and other locations. In another interesting test, a supplementary

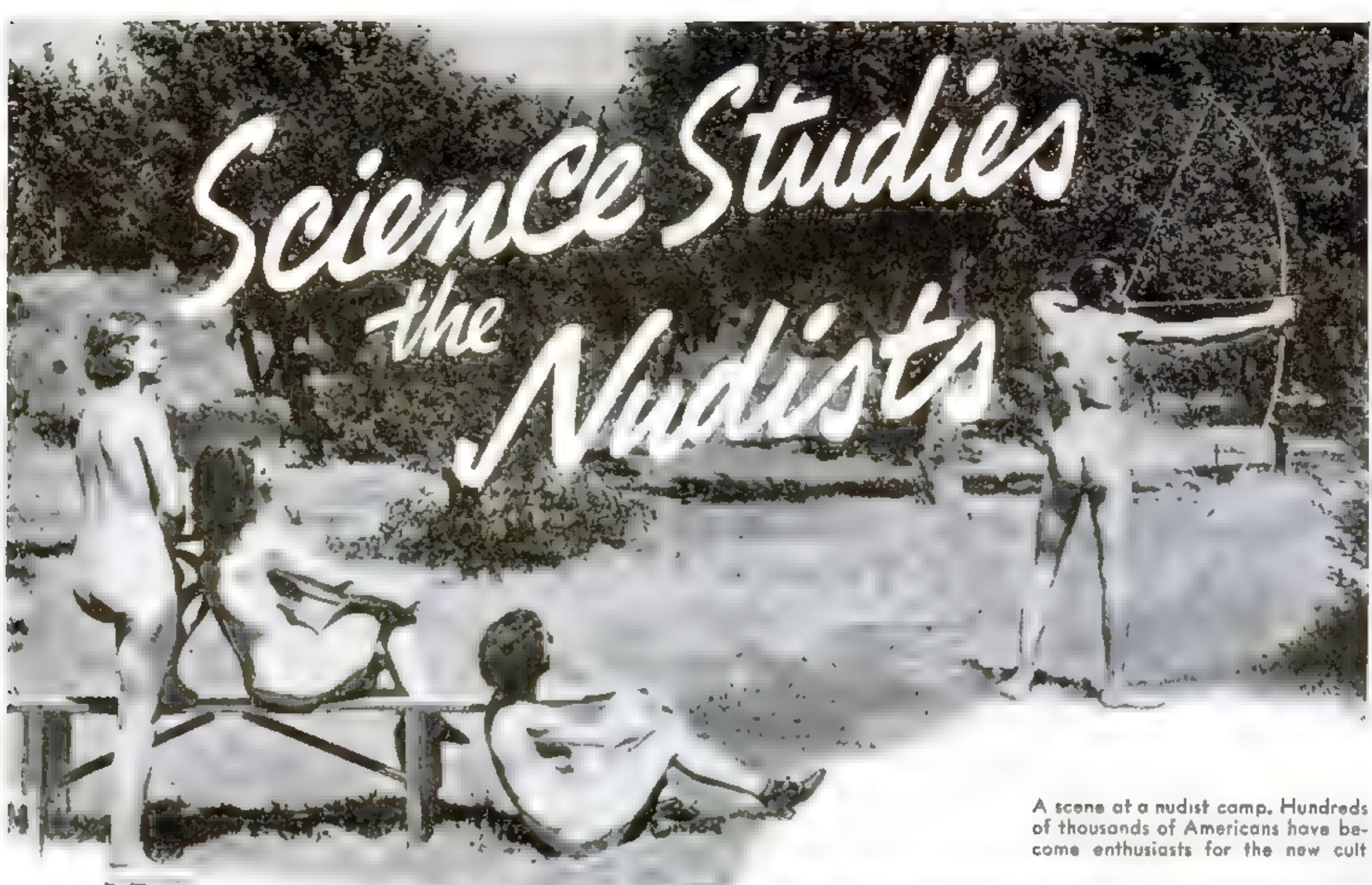
wheel is mounted on the steering column above the conventional wheel. The former is equipped with a special scale with which experimenters can determine the exact pressure required to steer the car around a sharp curve. Determining the precise center of gravity in a new model is accomplished by mounting the car in a giant pendulum device that resembles an old-fashioned garden swing. By noting the time required for the car to make one complete oscillation in the swing, engineers are able to calculate its exact center of gravity.

## Holder for Shaving Brush

BECAUSE bristles should dry while hanging downward, to prevent water from seeping into the handle, a new shaving brush has a case designed to hold it in this position. Made in the form of a half cylinder, the composition case supports the inverted brush without allowing it to rest on the bristles, as indicated at the right.



# Science Studies the Nudists



A scene at a nudist camp. Hundreds of thousands of Americans have become enthusiasts for the new cult

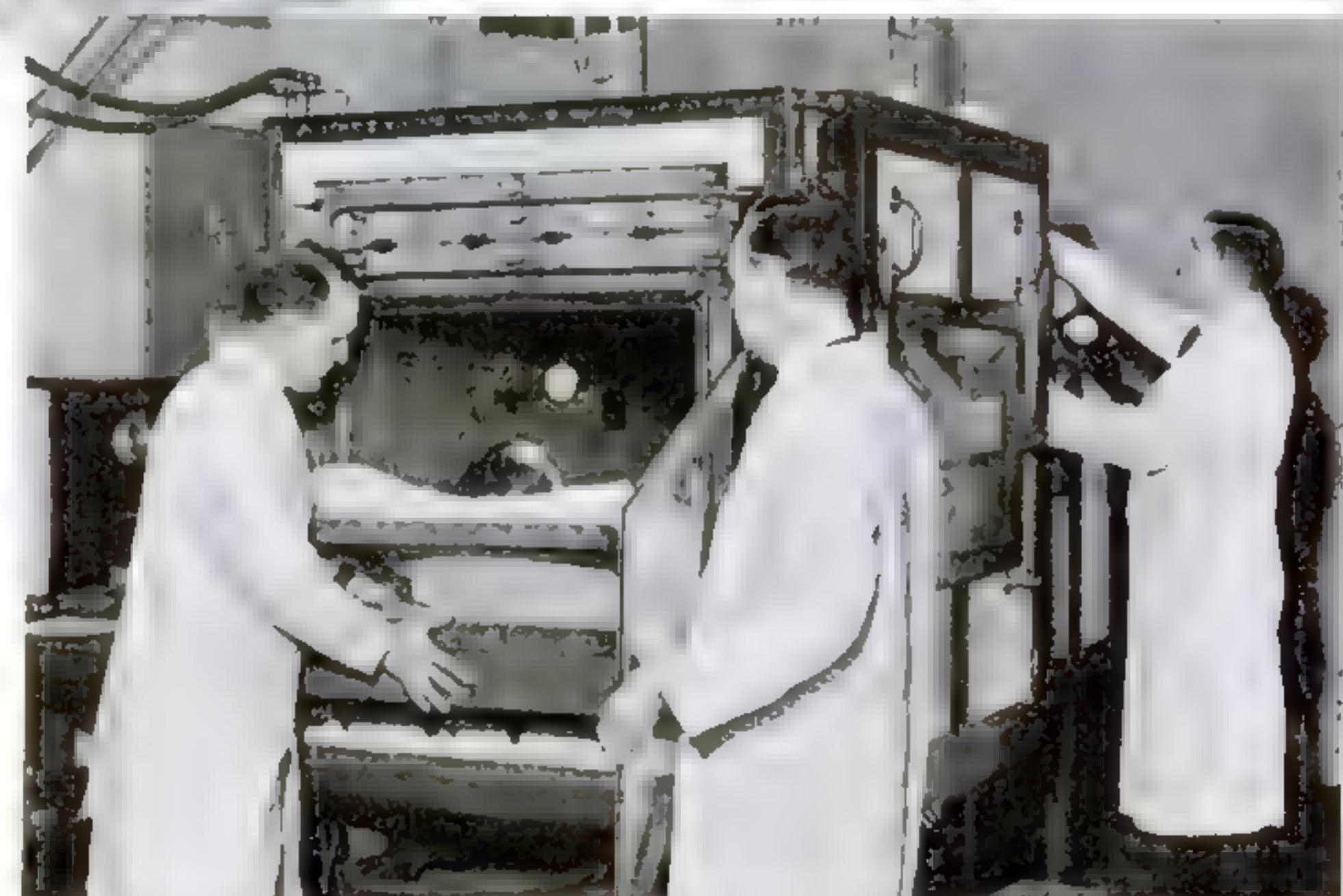
**STRANGE TESTS MADE IN THE LABORATORY REVEAL HOW THE NAKED HUMAN BODY REACTS TO SMALL CHANGES IN TEMPERATURE**

By EDWIN TEALE

THREE hundred thousand men, women, and children, in America alone, are nudists. Followers of the "back-to-Eden" cult report that, during one ten-month period, members increased at the rate of 10,000 a month. Nearly 400 camps, scattered from coast to coast, are being maintained by the faddists for nude sunbathing.

Does nakedness really benefit health? Are the claims of the nudists justified? Can our bodies, if given a chance, insure themselves to cold and inclement weather?

For almost the first time, science is seriously considering some of these questions. As this is written, two New York research workers, Dr. Eugene F. DuBois and Dr. James D. Hardy, have concluded a long series of tests at the Russell Sage Institute of Pathology to determine how the body regulates its temperature. During their experiments, they constructed a "mechanical man" with a leather "skin"; they created special recording apparatus; they spent



Experimenters at the Russell Sage Institute of Pathology placing a nude subject in the clinical calorimeter, or heat-measuring chamber, to test reactions to temperature changes

hours, with clothes removed, sealed in the copper vault of a supersensitive, \$10,000 heat-measuring chamber called a clinical calorimeter.

This immense apparatus is the most accurate of its kind ever built. Running ice water and high-resistance electric wires balance heat and cold, at the will of an operator, to keep the two walls of the double-walled copper shell at exactly the same temperature. Automatically, oxygen enters the chamber as it is needed, while a battery of bottles, containing chemicals, measures the carbon dioxide and the moisture produced by the man in the chamber.

By means of a special wax, which was devised for the purpose, two heavy plates of glass are sealed over the opening of the vault, after a subject has entered, to make the chamber airtight. G. F. Soderstrom, electrical engineer at the Sage Institute, originally built the calorimeter for research in fever. It is so sensitive that it is possible to tell whether a subject within is awake or asleep by the difference in the heat output of the body as recorded by the apparatus.

During the DuBois-Hardy tests, the scientists have tackled such problems as how the nude body reacts to differ-

ent temperatures, how efficient human flesh is as an insulating medium, when shivering begins, and whether a fat man can withstand cold better than a thin one. They remained nude in the sealed chamber of the calorimeter at temperatures that ranged from ninety-six to seventy-two degrees Fahrenheit. In some tests, they were clothed in wool and cotton ski suits; in others, subjects slept all night sealed in the copper vault.

The result is an accumulation of data which gives us a scientific basis for judging some of the claims of nudism. Human flesh, the experimenters report, is as efficient as an insulating medium against cold as is paper, leather, asbestos, or cork. However, there is only

a small difference between fat and thin persons in their ability to withstand cold for long periods. Incidentally, the tests show that a quiet subject, without the protection of clothing, will begin to shiver at a surprisingly high temperature, eighty-three degrees, approximately ten degrees higher than the average room temperature in a furnace-heated home. This trembling is nature's method of producing extra heat through muscular activity. Athletes, exerting themselves to the limit, sometimes raise their body temperatures to 103 degrees. Goose pimples, produced by cold, are of no value in keeping the body warm. They are simply vestiges remaining from a prehistoric time when man was covered with hair.

Only within a small range above eighty-three degrees Fahrenheit, is the naked body fitted to meet variations in temperature without considerable mus-

cular activity. The experimenters have listed three "zones" within each of which the body functions in a different manner.

At the top is the "warm zone," above eighty-six degrees. Blood flows to the skin, which radiates away the heat. Sweating aids in the elimination of excess internal warmth. In the middle is the so-called "comfort zone," between eighty-three and eighty-six degrees. Here the body acts like an automatic thermostat. If the temperature rises, more blood flows to the skin and more heat is eliminated; if the temperature goes down, the blood supply to the skin is reduced and the body heat conserved. At the bottom is the "cold zone," below eighty-three degrees. Because the blood supply to the skin is throttled down to a minimum by the time the upper limits of this zone are reached, the body can do little to halt the increasing loss of heat. The extra warmth generated by shivering may raise the temperature of the body half a degree, but this heat is soon dissipated.

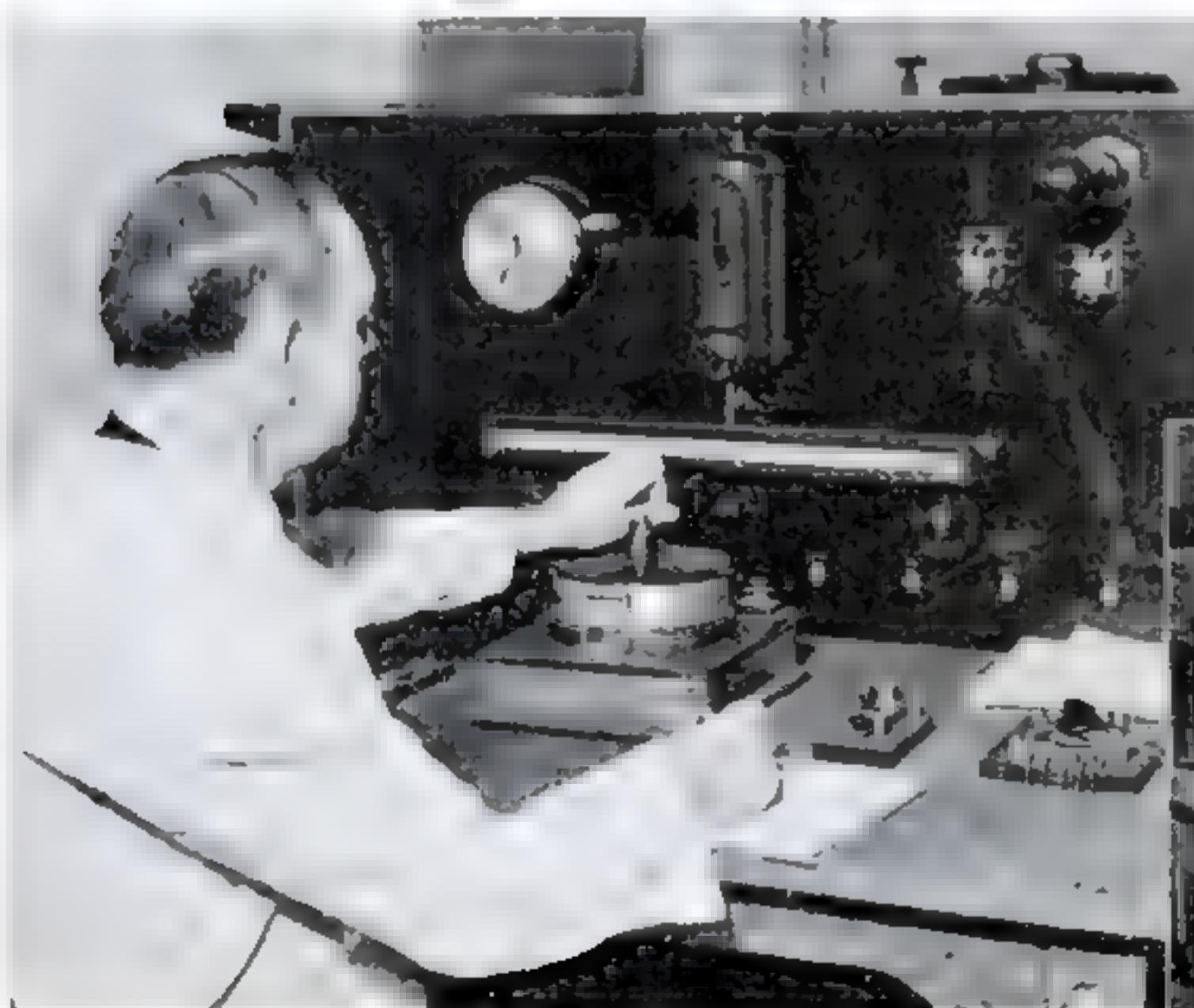
No amount (*Continued on page 126*)



Dr. James D. Hardy with the "mechanical man" used in some of the tests



This complicated set-up controls the temperature of the water flowing through the lining jacket of the calorimeter



G. F. Soderstrom, builder of the calorimeter, adjusting the intricate apparatus from the control panel. The battery of bottles at right determines the amount of moisture and carbon dioxide



Nudists reading the schedule of daily activities on a camp bulletin board. Scientific tests seem to refute claims made for the fad

# POPULAR SCIENCE

## Question Bee

Here is a jumble of facts and foolishness, blended for your diversion. Only one of the answers given after each of these twenty-five questions is correct. Can

you pick it out? Jot down the corresponding letter for each one and then check your answers with the list that is printed on page 130, to see what score you have made.



**1** It pays to watch your step on an icy sidewalk, because ice has a low (a) specific gravity (b) relative humidity (c) surface tension (d) frictional resistance (e) index of refraction (f) viscosity.

**2** Warships boost planes into the air with (a) airometers (b) aquaplanes (c) catapults (d) catamarans (e) planimeters.

**3** If you want to see yourself full-length in a wall mirror, you must buy one (a) as tall as you are (b) half your height (c) with extra mirror panels at the sides.

**4** Logarithms are useful because they (a) help the poet (b) support heavy architectural columns (c) save time in multiplying and dividing numbers (d) speed up logging operations (e) mark places to pause in a passage of orchestral music.

**5** A straight line that just grazes the rim of a circle is called (a) a detriment (b) an increment (c) a rudiment (d) an indigent (e) a tangent (f) a portent (g) a lineament (h) a delinquent (i) a detergent.

**6** You would be foolish to go tiger-hunting in Africa because (a) the Africans consider the tiger a sacred beast and its killing is strictly prohibited (b) the hide of the African tiger is impervious to rifle bullets (c) tigers are not native to Africa (d) hunters have already exterminated the African tiger.

**7** A minor planet, or planetoid, also is sometimes referred to as (a) an asterisk (b) an ascarid (c) an asteroid (d) an artery.

**8** The Schick test determines (a) whether you are susceptible to diphtheria (b) the gold content of an object (c) the quality of cows' milk (d) your rating in intelligence (e) the amount of nicotine in tobacco.

**9** A translucent object cannot be (a) thick (b) light blue (c) compact (d) opaque (e) combustible.

**10** The opposite of an acid is (a) a carbohydrate (b) an alkali (c) a bromide.

**11** Though we are apt to think of lead as the heaviest metal, a heavier one is (a) copper (b) iron (c) gold (d) aluminum.

**12** Micronesians are (a) particles of dust found floating in city air (b) inhabitants of certain Pacific islands (c) the bacteria that sour milk (d) instruments for measuring molecules.

**13** Odometers measure (a) angles (b) smells (c) mileage (d) the flow of large streams.

**14** Dried coconut meat, the raw material from which coconut oil is made, will be what you will get if you order some (a) latex (b) saltpeter (c) viscose (d) copra (e) plumbago.

**15** If you drop calcium carbide into a can of water, it will (a) explode (b) eat a hole in the can (c) produce acetylene gas (d) turn green (e) form a layer of ice on the surface.

**16** A heavenly body that revolves around another one, as the moon does about the earth, is called a (a) satellite (b) meteorite (c) theodolite.

**17** The name "Brownian movement" is given to (a) the works of certain fine watches (b) the dancing motion of microscopic particles suspended in a fluid (c) a campaign to reduce the number of unemployed by abolishing all labor-saving machinery (d) an educational system originated at Brown University.

**18** The part of an electric motor that spins is its (a) stator (b) ligature (c) armature (d) animator.

**19** "I.Q." means (a) "Identical quintuplets" (b) "Infusion of quinine" (c) "Indefinite quantity" (d) "Intelligence quotient" (e) "In quarantine" (f) "Impertinent question."

**20** In an aviary, you would expect to find (a) birds (b) airplanes (c) bees (d) tropical fish.

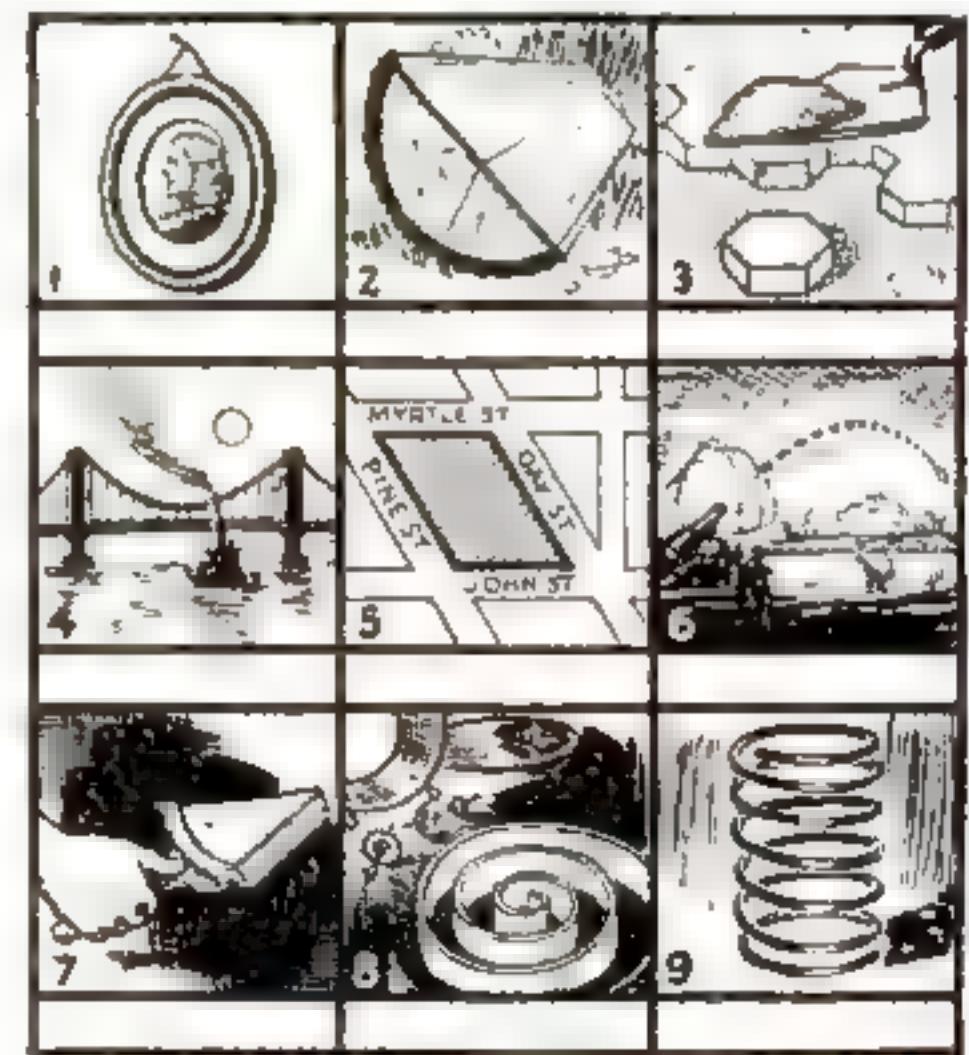
**21** "Roses are red, violets are blue; The fizz in a soda is . . . (a) SO<sub>2</sub> (b) CO<sub>2</sub> (c) CS<sub>2</sub> (d) NO<sub>2</sub>."

**22** One of the great medical discoveries of modern times was the treatment of diabetes with (a) insulin (b) cod-liver oil (c) bicarbonate of soda (d) iodine.

**23** A star that suddenly flares into brilliance is called (a) a nebula (b) a meteor (c) a nova (d) a troglodyte (e) a neolith.

**24** If you stare for awhile at a bright green object and then turn away, you will see (a) red (b) stars (c) double.

**25** An amalgam contains (a) twenty-five and three fifths fluid ounces (b) mercury (c) a complete assortment of printer's type (d) a mummy (e) medicinal seaweed.



Each of these drawings contains an example of one of the geometrical terms listed below. See whether you can label them correctly, comparing your answers with those on page 130.

spiral      ellipse      sector of circle  
helix      segment of circle      prism  
parabola      catenary      parallelogram

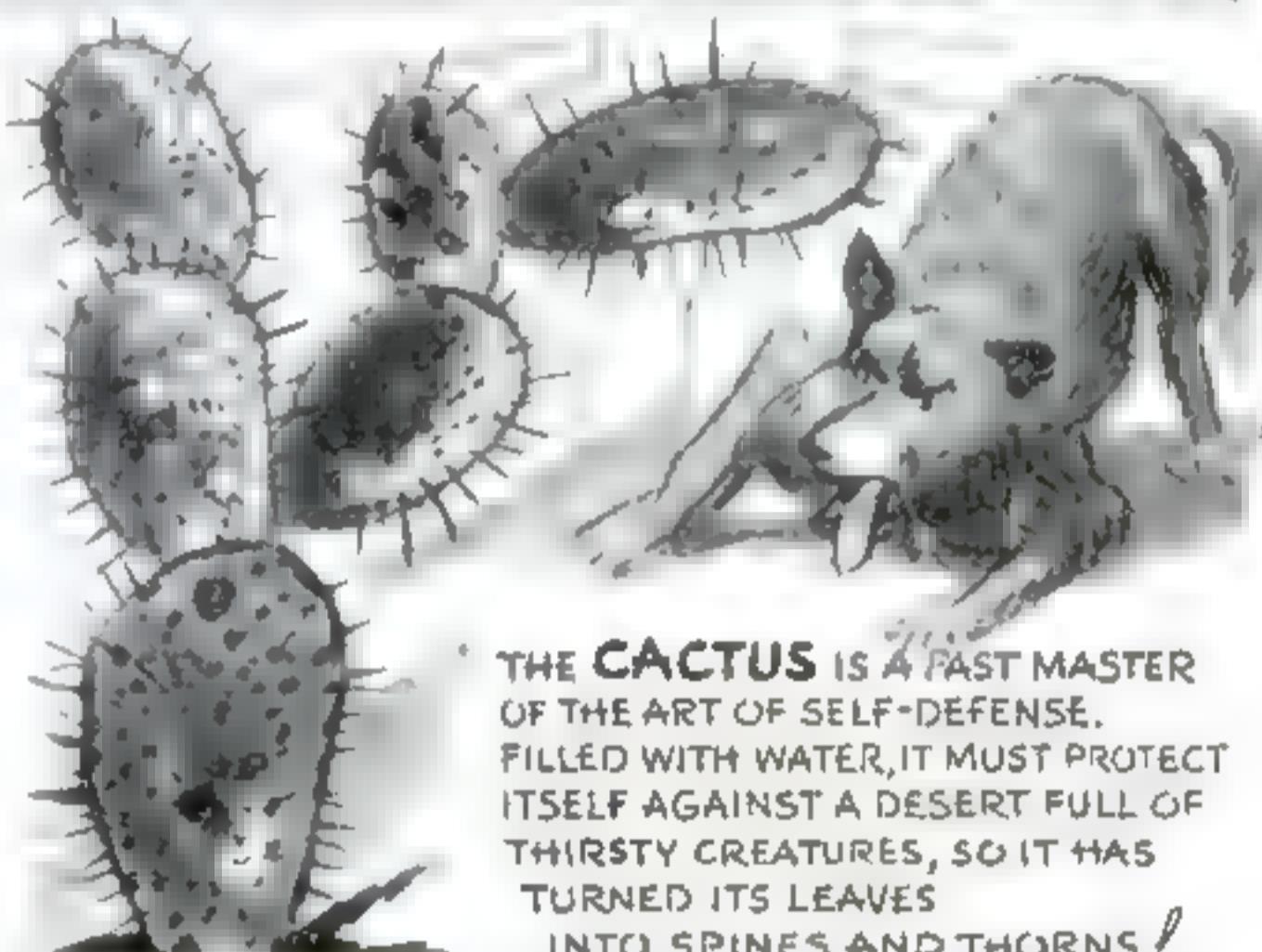
# Un-Natural History

By  
GUS MAGER

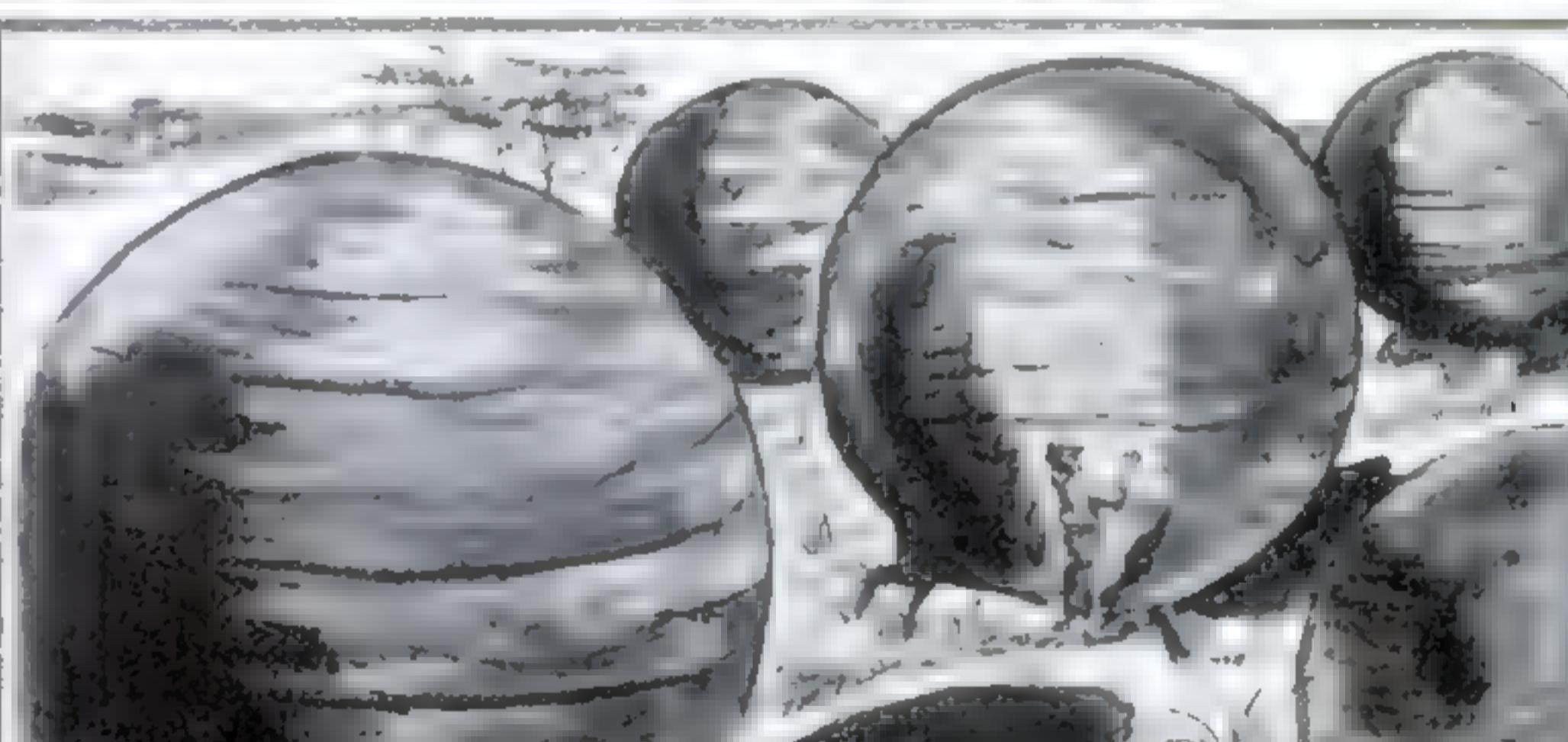
COWS HAVE NO  
UPPER FRONT TEETH!



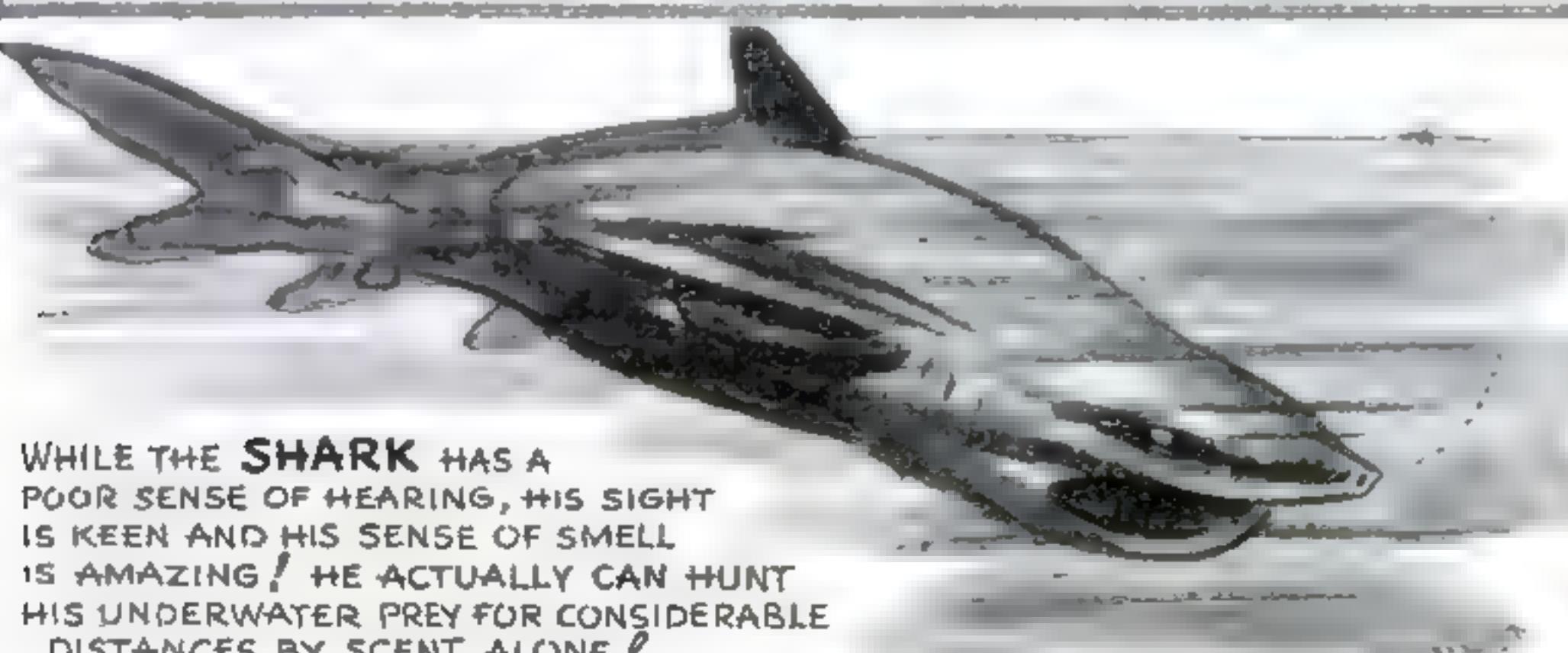
NATURE'S NO. 1 MISCHIEF MAKER IS THE WOLVERENE! NOT SATISFIED WITH STEALING THE BAT FROM TRAPS, IT HIDES THE TRAPS THEMSELVES AND SOMETIMES EVEN CARRIES AWAY THE FASTENINGS! FATAL FIGHTS HAVE OCCURRED BECAUSE TRAPPERS SUSPECTED THEIR NEIGHBORS OF SABOTAGE!



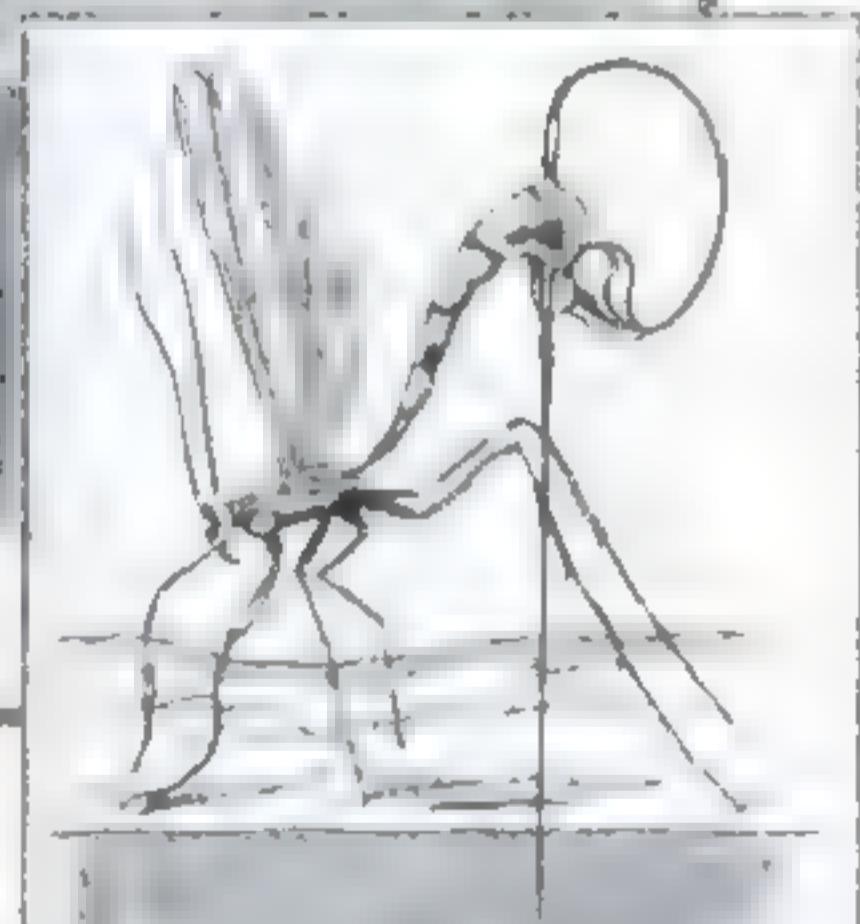
THE CACTUS IS A FAST MASTER OF THE ART OF SELF-DEFENSE. FILLED WITH WATER, IT MUST PROTECT ITSELF AGAINST A DESERT FULL OF THIRSTY CREATURES, SO IT HAS TURNED ITS LEAVES INTO SPINES AND THORNS!



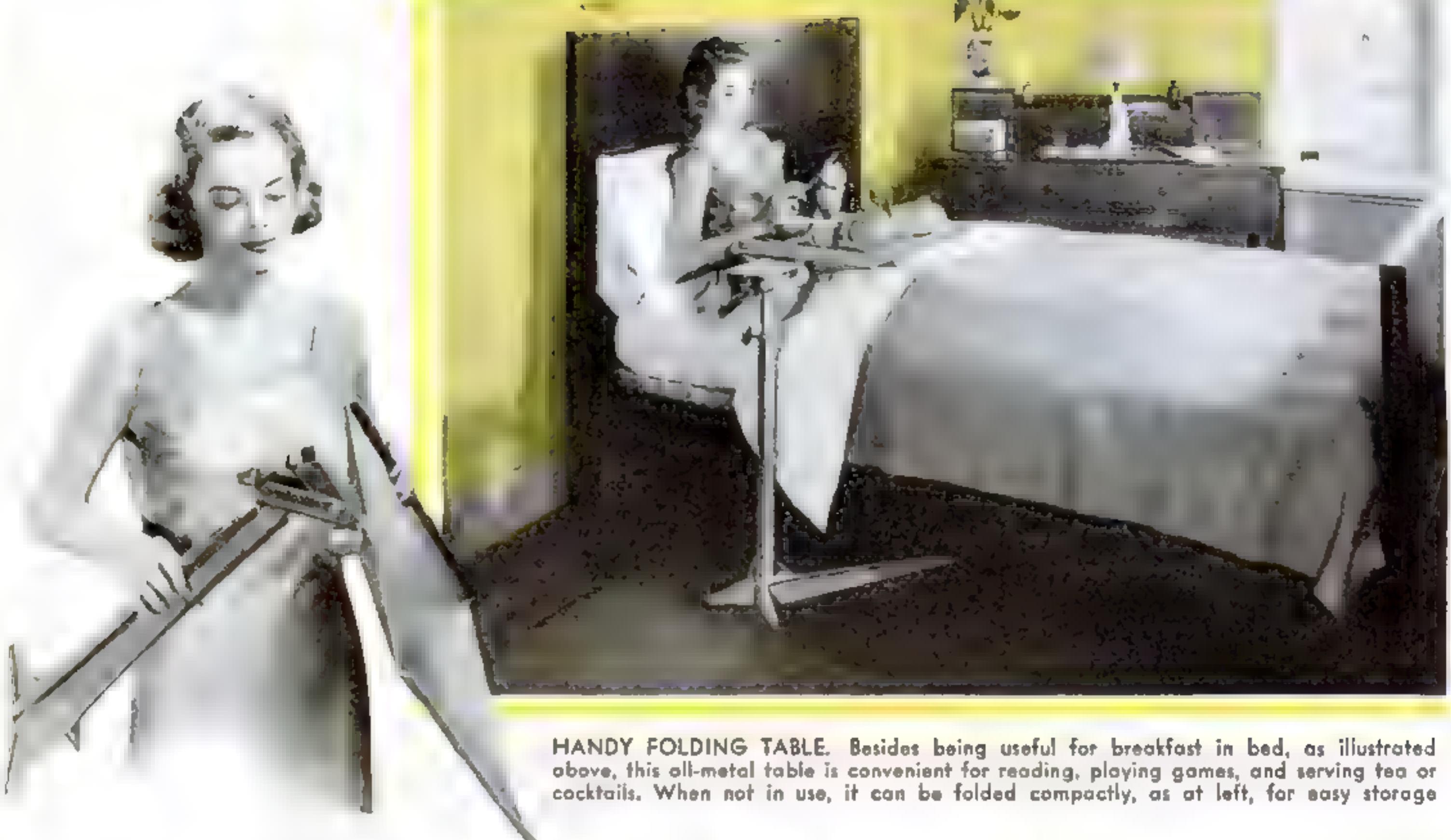
FATHER TIME, WITH HIS ASSOCIATES WIND AND WATER HAS FASHIONED THESE TITANIC BOWLING BALLS, TO BE SEEN NEAR THE TOWN OF MINNEAPOLIS, KANSAS!



WHILE THE SHARK HAS A POOR SENSE OF HEARING, HIS SIGHT IS KEEN AND HIS SENSE OF SMELL IS AMAZING! HE ACTUALLY CAN HUNT HIS UNDERWATER PREY FOR CONSIDERABLE DISTANCES BY SCENT ALONE!



HUMAN WELL DRILLERS MIGHT TAKE A LESSON FROM THE ICHNEUMON FLY, WHICH DRILLS DEEP INTO A LIVING HARDWOOD TREE AND UNERRINGLY HITS THE TINY BURROW OF THE LARVA BESIDE WHICH SHE DEPOSITS HER EGGS!



**HANDY FOLDING TABLE.** Besides being useful for breakfast in bed, as illustrated above, this all-metal table is convenient for reading, playing games, and serving tea or cocktails. When not in use, it can be folded compactly, as at left, for easy storage

## Inventions FOR THE



**DIVIDED SPICE JAR.** Radiating partitions divide a new container into separate compartments for six different kinds of spices. A rotating cover can be turned until a slide-door opening is above the desired spice



**REFRIGERATOR DEODORIZER.** Placed in a refrigerator, the device illustrated at the right absorbs odors and keeps food flavors from mingling. A built-in thermometer helps maintain the proper temperature



**LEMON JUICER.** Designed on a novel principle, the lemon juicer shown below has a special toothed cutter over which the lemon is twisted. Once in place, the fruit need only be squeezed to get the juice



**INDOOR CLOTHES DRIER.** Heated by gas, a compact drier offers a new solution to the problem of laundering clothes in bad weather. Hanging space is the equivalent of ninety-six feet of line, and curtains serve to keep heat in and exclude dust. Installation is simple, requiring only a flexible connection to any convenient gas jet

### POURER SPOUT FOR CANS

Liquids are poured from cans without dripping, with the spout shown at the right. When an arrow-shaped blade of stainless steel is pushed through the metal top, the liquid flows out. A vent in the upper edge admits air



### ... AND FOR CARTONS

Punched through the side of a cardboard carton, the device at the left gives a neat eye-like opening for pouring powdered or flaked groceries



## HOUSEHOLD



RUBBER FEET FOR PAILS. Clipped over the rolled bottom edge of a pail, slotted rubber feet deaden noise, protect floor surfaces, and prevent sliding

### CUP DISPENSER

Paper cups for household use are now supplied in a convenient dispensing carton that hangs on the wall. The cups are removed as shown in the picture



### STOVE-TOP PAD

Rough pots and hot pans can't injure the enameled top of a modern stove if it is protected with this flexible mat of composition material. Washable, it is supplied in colors to harmonize with any color scheme

BOWL HOLDER. Gripped by a large suction cup, a mixing bowl is held securely by this handy device, which clamps to a table. The holder rotates on its base



### MAGNETIC CAN OPENER

Pieces of metal shavings that might drop into food taken from cans, are said to be removed by a new can opener of magnetized metal. Operated like any conventional can opener, the tool is reported to hold shreds of metal firmly until they are removed by washing



As Johnson watched, Gus dug the snow away from the rear wheels and spread the chains out in front of the tires, poking the ends well down under the treads

Illustration by  
FRANK HUBBARD



## How To Use Skid Chains

GUS WILSON placed the telephone receiver back on its hook. "I had a hunch we'd get a call like this from Johnson before the winter was over," he grumbled to Joe Clark, his partner in the Model Garage. "He's stuck in a snow drift a block or so out on Livingston Street. You'd better come along and lend me a hand."

A few minutes later, Gus brought the service car to a stop beside a large sedan that was almost hub-deep in the soft snow that edged the road. Judging from the ruts in the snow, the owner had made several attempts to free his car before calling the Model Garage.

"Got your chains handy, Mr. Johnson?" asked Gus, as he inspected the position of the stuck car.

"Never use them!" snapped Johnson. "The chains haven't been made yet that are any good. All they do is bounce you along the road and help you to skid."

Gus said nothing. Long experience with obstinate car owners had shown him that it was useless to argue. Instead, he unstrapped the short shovel that hung on the side of the service car, and rummaged around in his trunk-size tool kit for a pair of old chains

that would be large enough to fit Johnson's tires.

As Johnson watched, Gus dug the snow away from the rear wheels and spread the chains out in front of the tires, poking the ends well down under the treads.

"Watch it now, Joe," he warned, as he climbed into the driver's seat, started the motor, and let in the clutch gently. For a moment the wheels spun, but as they gained traction on the cross links of the chains, the car moved ahead slowly to the harder snow in the middle of the road.

"If you'd use these," said Gus as he picked the chains up out of the snow, "you'd spare yourself a heap of trouble. Just what is your pet peeve against chains anyway?"

"Plenty," grumbled Johnson. "They're pesky things to put on, they're noisier than the devil, they make your car skid sideways, and before you know it they're worn out and pounding dents in your fenders. And besides, they—"

"Whoa!" interrupted Gus with a chuckle. "Let's take one thing at a time. I'll admit chains aren't the easiest things in the world to put on, but if you use a little common sense you can do

the job without even rolling up your sleeves. Watch."

Gus spread the two chains out neatly behind the rear wheels with their snap ends nearest the tires. Then he pushed the end of one of the side chains through the spoke hole at the bottom of one of the wheels and snapped it onto the side chain on the other side of the tire. This served to fasten the end of the chain to the tire. When he had repeated the operation with the other rear wheel, he climbed back into the driver's seat.

"Now, all we've got to do is put the car in reverse, back up slowly, and presto—both chains will be around the tires."

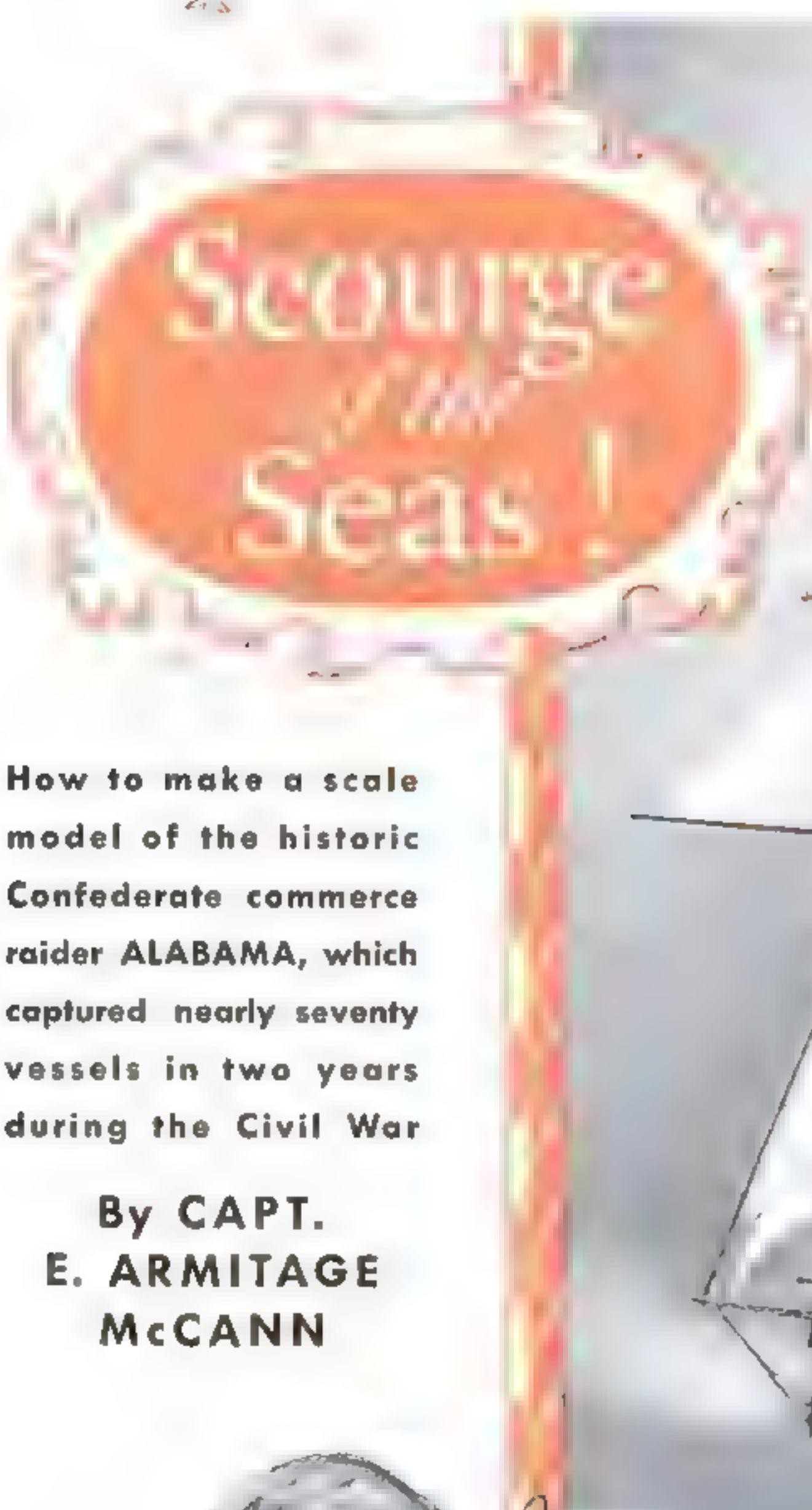
As the car moved backwards, the rear wheels rolled over the cross links and the ends looped through the spokes held the front of the chains snugly against the treads. After one complete turn, the chains were entirely around the tires and all that was needed to finish the job was to fasten the ends together.

"There, that wasn't so bad, was it?" asked Gus, drying his hands on his overalls.

"You win, Gus," agreed Johnson, grinning. "But you will have to admit that chains can get you into some pretty bad side (*Continued on page 128*)

By MARTIN BUNN

# THE HOME WORKSHOP



How to make a scale model of the historic Confederate commerce raider ALABAMA, which captured nearly seventy vessels in two years during the Civil War

By CAPT.  
E. ARMITAGE  
McCANN



Built on the scale of 3/32 in. equals 1 ft., the "Alabama" model is 28 in. long, 16 in. high over all. She was rated as a "steam sloop, bark rigged."

**R**ENEWED interest in the Civil War period seems to have come with the wind! Apart from this, the cruise of the Confederate commerce raider *Alabama* has always been one of the most picturesque sidelights in American history. Her career was short, but during it she almost entirely paralyzed Federal shipping and marine transport, capturing ships right and left and tying up whole fleets in their ports.

She started her amazing cruise on August 24, 1862, under the command of Capt. Raphael Semmes and was sunk in battle with the *Kearsarge* on June 19, 1864, off Cherbourg, France. Between those dates she captured nearly seventy vessels. She also caused about 350 American ships to be transferred to British registry in one year. That incredible record made her the most famous scourge of the seas in all history.

From the modeler's viewpoint the *Alabama* has the additional advantage of being exceptionally good looking and





## CAPTAIN McCANN LAYS DOWN HIS SHIP MODEL MAKING TOOLS



WHILE the *Alabama* model stood freshly finished on his workbench and the pencil manuscript was spread out before it for a final checking, Capt. E. Armitage McCann was taken seriously ill in his Ridgefield, Conn., home and died three days later on October 6, 1937. He was sixty-two years old.

Captain McCann's ship model contributions to this magazine, which began in February, 1926, did more than anything else to popularize the hobby of ship model making. Countless thousands have built models from his plans. His enthusiasm and skill were, indeed, responsible for perhaps the most remarkable amateur craftwork movement in the world, because many men who had never seen a large ship or been to sea were inspired by him to construct accurate and beautifully detailed galleons, clippers, and warships.

It would take a second Joseph Conrad to do justice to Captain *(Continued on page 125)*

having a variety of interesting features in her rig and details.

The *Alabama* was officially rated a "steam sloop, bark rigged." She was built by Laird Brothers, Birkenhead, England, in 1862. Her dimensions were: length, 230 ft.; beam, 32 ft.; molded depth, 19.9 ft.; draft, 15 ft. Her registered tonnage was 1,040, and her engines developed 300 h.p. Built entirely of wood, she was designed more for speed than strength.

As the exact lines or plans for the *Alabama* no longer exist, those given here are only approximate. Diligent research has, however, unearthed a lot of information about her, so it is believed that both hull and rig are reasonably correct.

The scale of 3/32 in. equals 1 ft. of the original has been chosen because it gives a sizable model with a hull 21½ in. long. The overall dimensions of the model are 28 in. long and 16 in. high.

To build the model successfully it is necessary to have full-size drawings of the hull lines and all the principal parts. The

complete plans will be given in the magazine during the course of the several installments into which this article will be divided, but most of them will necessarily be greatly reduced in size owing to the limited size of the magazine page. How much the drawings must be enlarged to make them full size will be indicated clearly in every case by means of an inch scale or otherwise. The half-breadth, sheer, and body plans below are exactly half size.

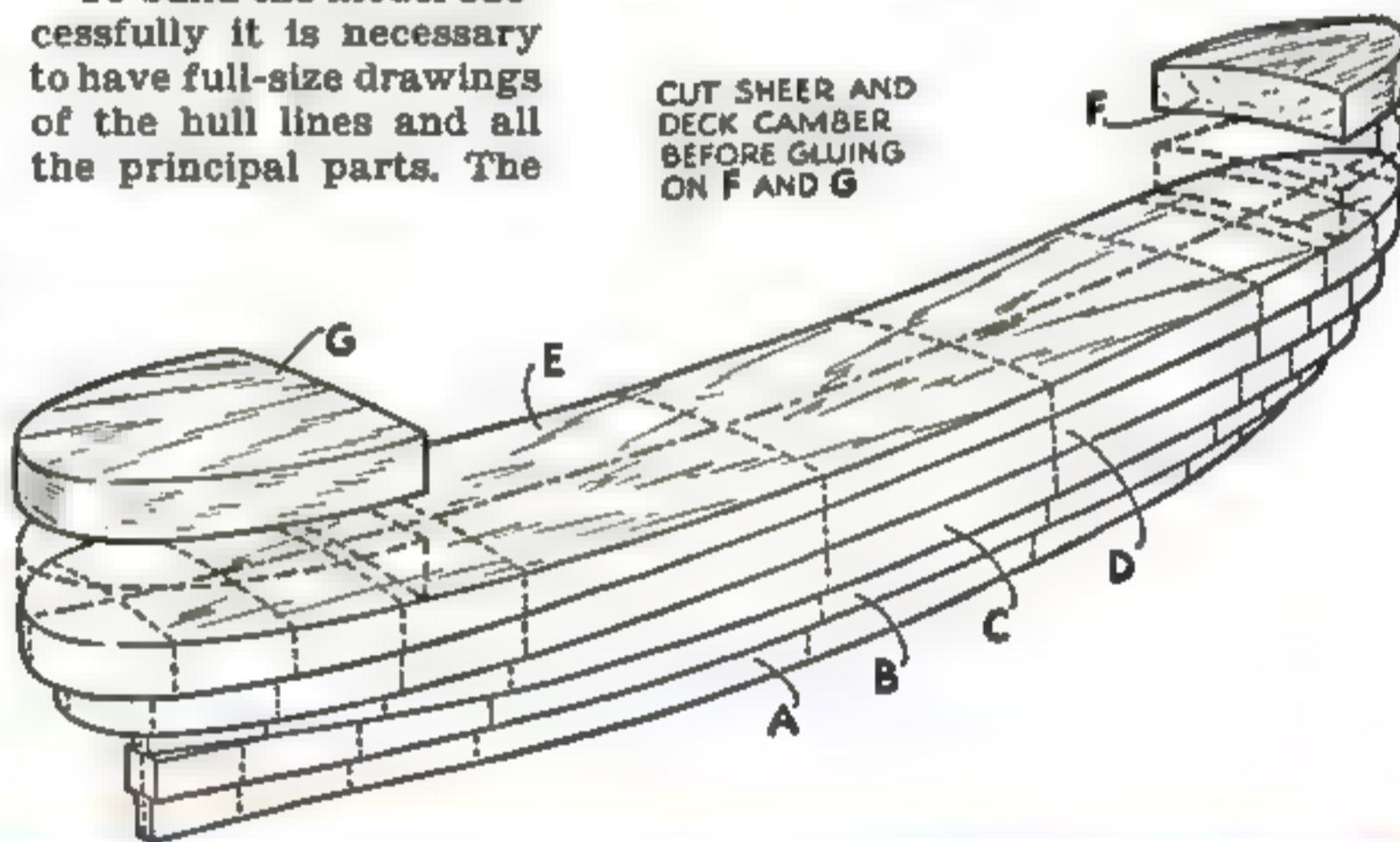
It is particularly important to get the hull correct in size and shape. Once that is done, the smaller parts can be shaped and added without much difficulty.

For the hull, five pieces of clear, straight-gained white pine 7/16 in. thick, 3 1/4 in. wide and 21 in. long are required. Transfer the half-breadth lines A, B, C, D, and E from the full-size plan to the wood with carbon paper or in any way you prefer. Also mark the construction lines II to VII and the midship or center lines on all.

Saw out the five pieces, leaving plenty of stock beyond the lines for shaving and sanding the hull later on. Next continue the construction lines over the edges, and glue the five parts together in the proper order, with the construction lines coinciding.

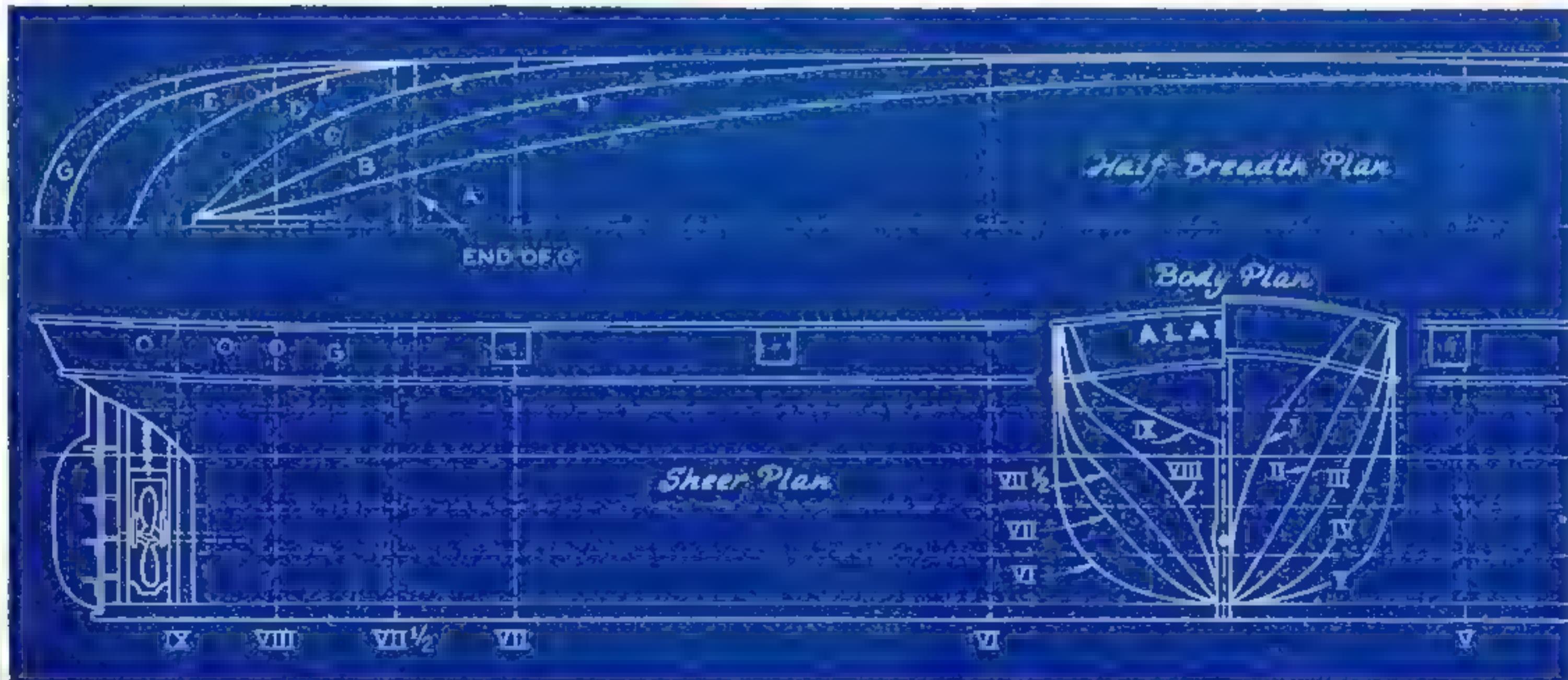
Although by no means essential with a model of this size, it is good practice to make the hull hollow in order to lighten it and to reduce the likelihood that it will warp. This may be accom-

CUT SHEER AND DECK CAMBER BEFORE GLUING ON F AND G



Half-Breadth Plan

Body Plan



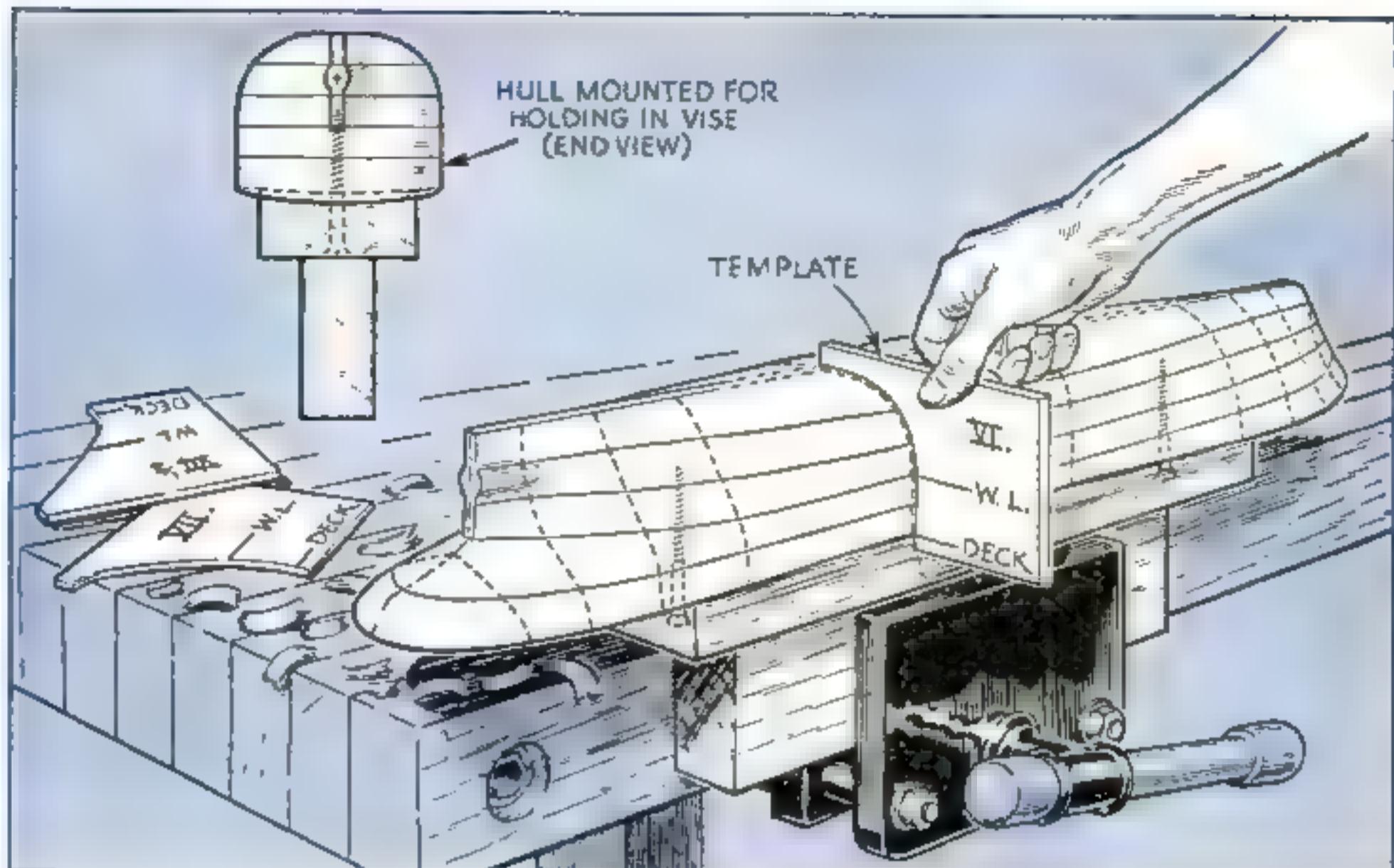
plished by jig-sawing the center out of lifts *B*, *C*, and *D* on a line drawn to within about  $5/16$  in. of the outline of the lift immediately below. Leave some solid wood in each lift across the center to serve as a crossbar and prevent the cut-out lifts from spreading when the pressure of the clamps is applied.

It is easiest to shave down the main deck before adding the poop and forecastle pieces *F* and *G*. With dividers, mark the edge of the deck by measuring up at intervals from the lower edge of lift *E*, taking these distances from the full-size sheer plan. Then shave right across the hull to bring the upper surface down to this deck line, but leave a slight rise or camber in the middle.

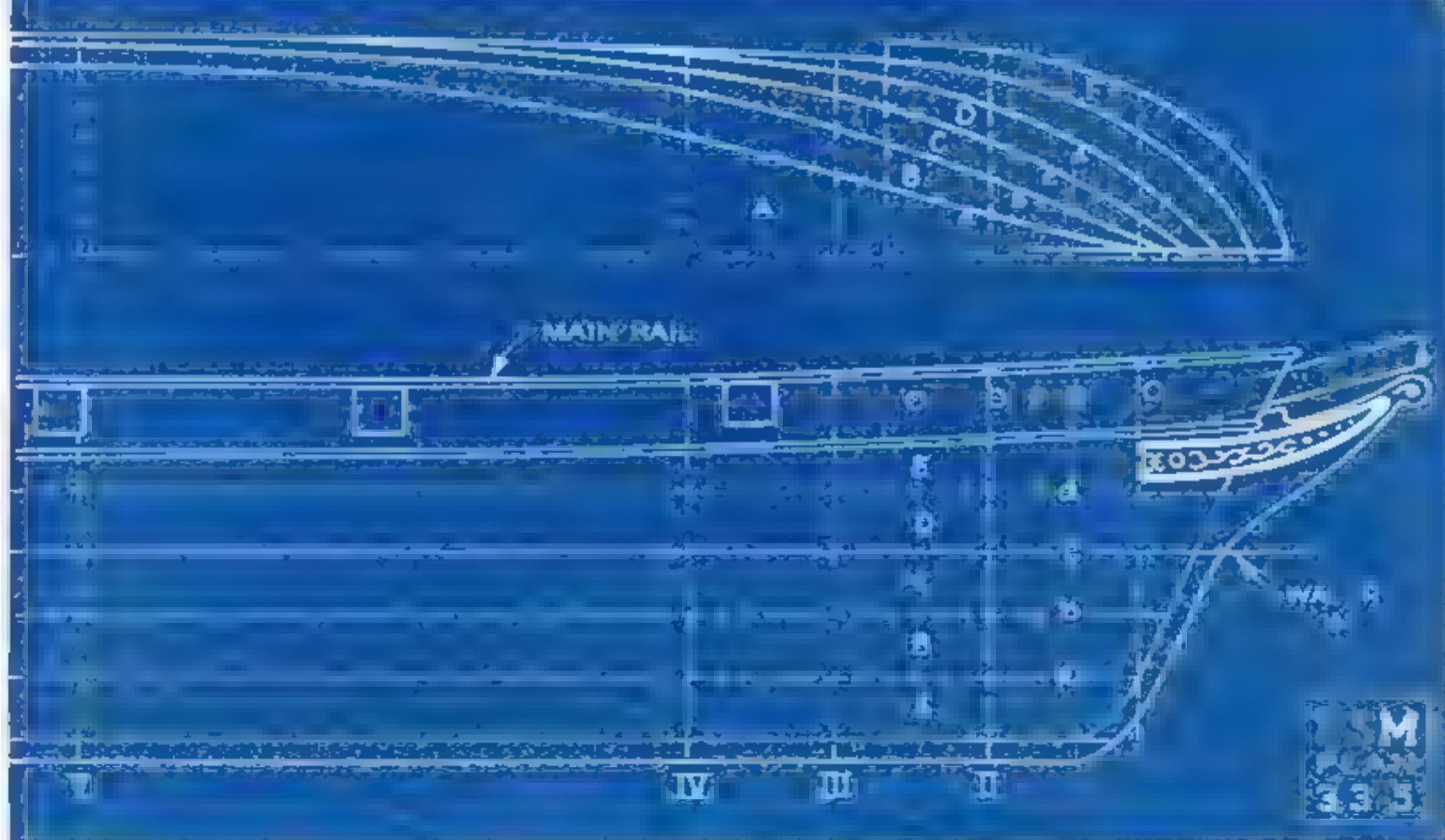
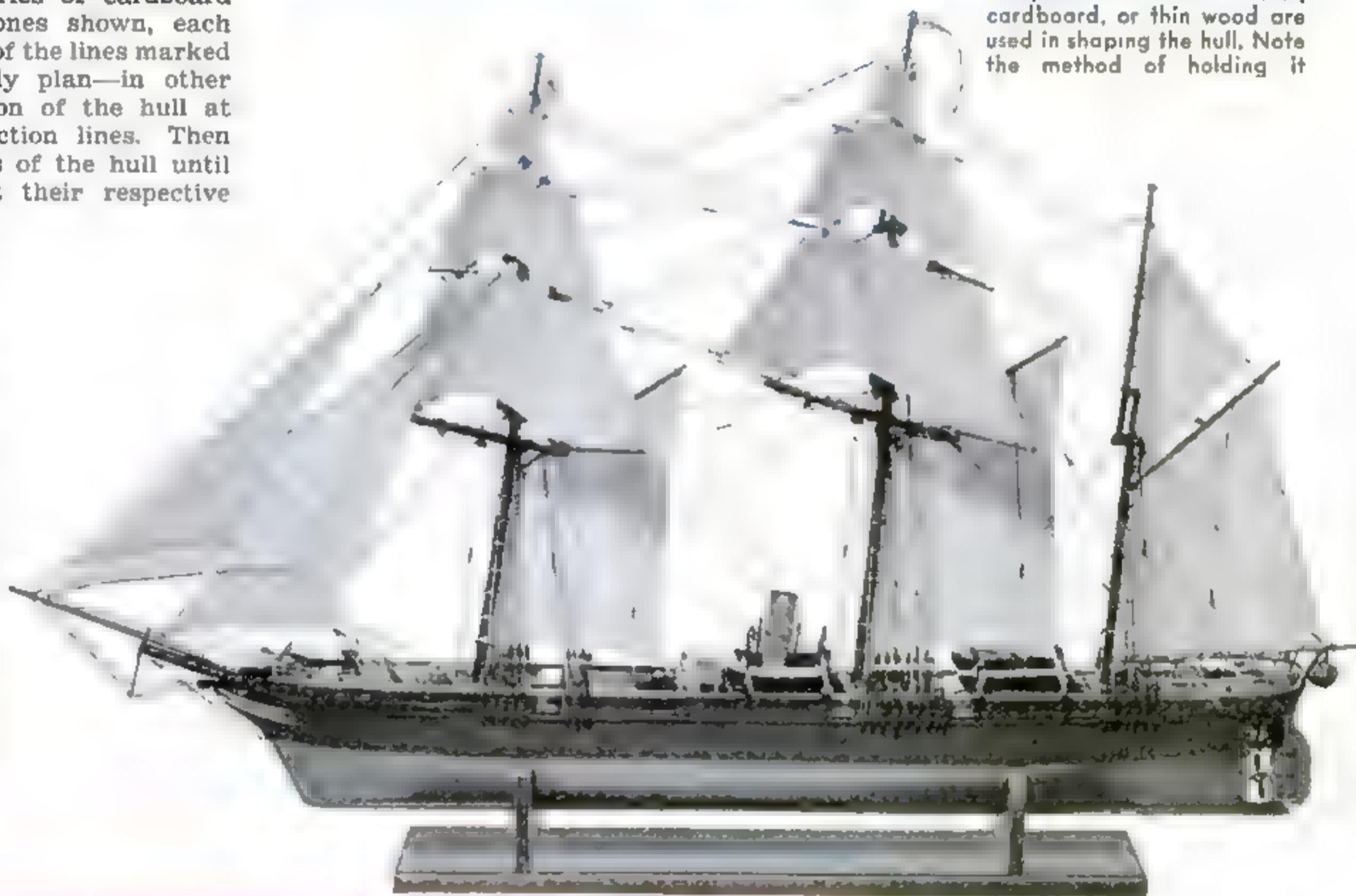
When this has been done, cut out and glue on the poop and forecastle pieces.

At this stage the hull looks like a series of steps, and it is necessary to shave away the corners to reveal the finished shape. To aid in doing this accurately, make a series of cardboard templates like the ones shown, each corresponding to one of the lines marked I to IX on the body plan—in other words, a cross section of the hull at each of the construction lines. Then carve away the sides of the hull until the templates fit at their respective positions.\* Be careful to get smooth curves and see that both sides are alike; this is more important, in fact, than strict adherence to the drawing.

Cut the stem to the shape shown in the sheer plan, using  $\frac{1}{8}$ -in. thick wood. Glue and nail it firmly in position. Under it and



Templates of sheet metal, cardboard, or thin wood are used in shaping the hull. Note the method of holding it



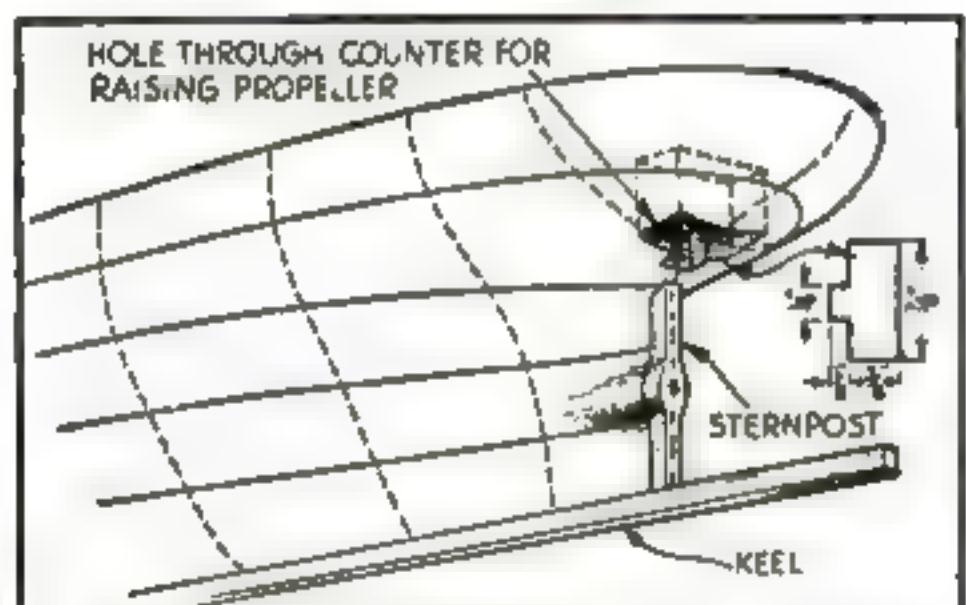
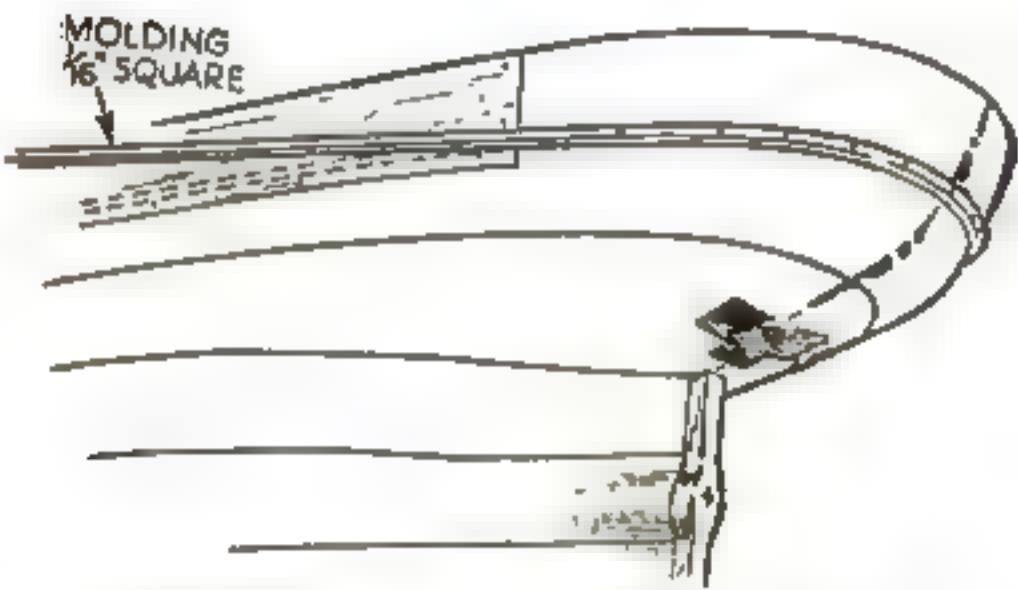
Side view of the completed model. The half-breadth plan, sheer plan, and cross-sections at the various station points are given at the left

the hull, fasten the keel, which is  $\frac{1}{8}$  by  $\frac{1}{8}$  in. Leave plenty of the keel projecting aft. Next shape and fasten the sternpost. It also could be made of the  $\frac{1}{8}$  by  $\frac{1}{8}$ -in. stock but for the fact that it has a bulge where the propellershaft goes through. Note this particularly; it can be seen in the body plan at the left of the center line and also in two of the sketches.

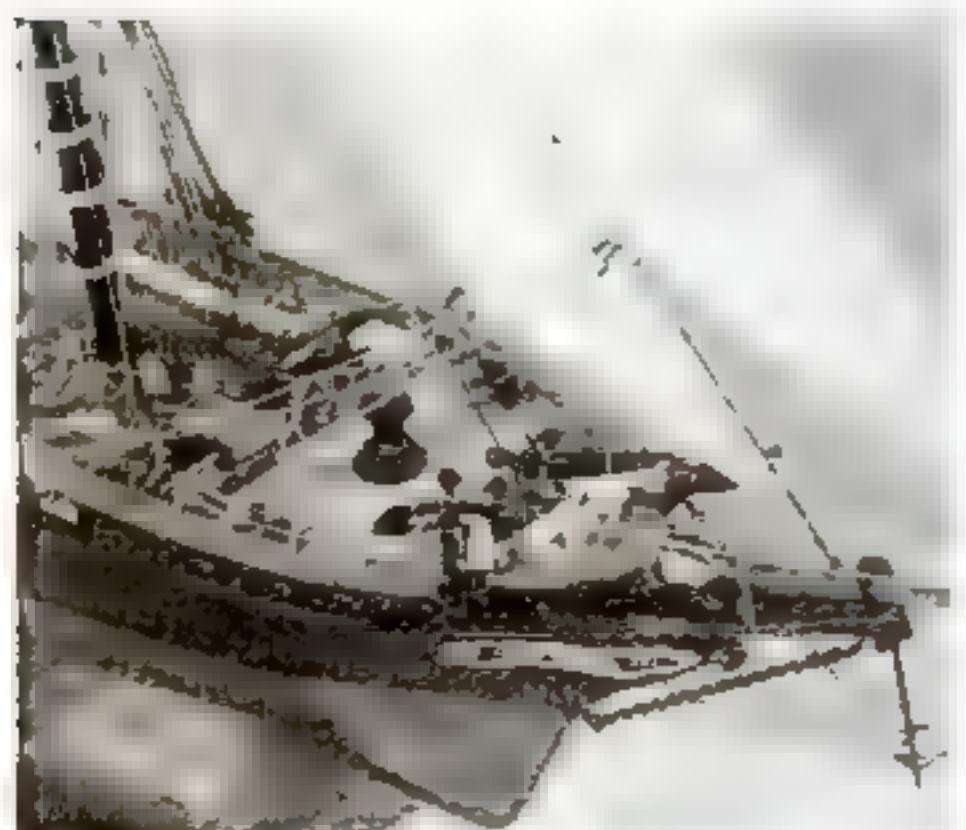
The bulwarks on the model have to represent the timberheads, the outer planking, and the lining, so they must be  $5/32$  in. thick. They can be set on the deck between poop and forecastle, but it is better to give them  $\frac{1}{4}$  in. extra depth



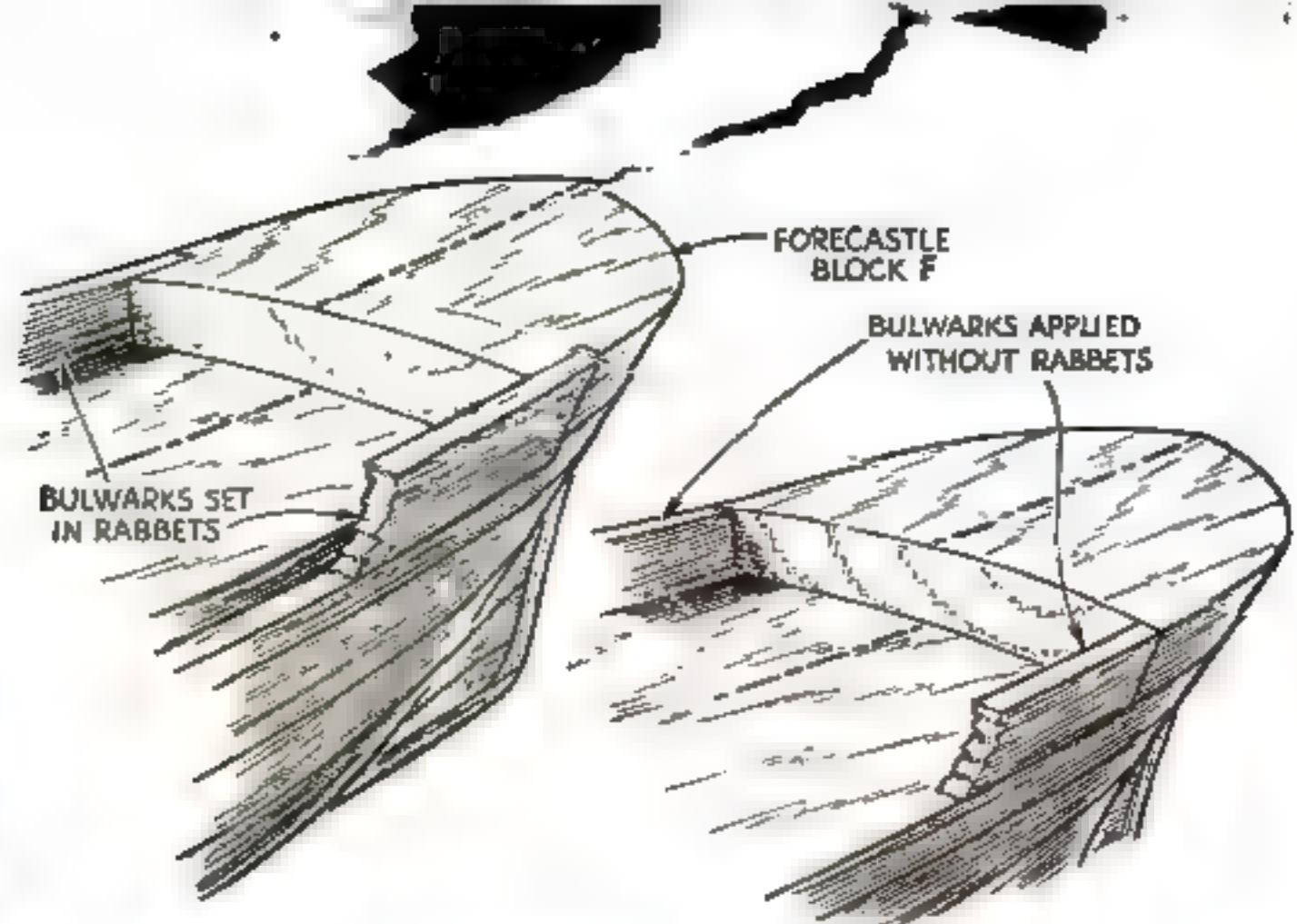
Grace and speed are written in every line of the "Alabama." The drawing at right is an amidship section showing one way of fastening the bulwarks



Two sketches of the stern showing molding, sternpost, keel, and hole for lifting propeller



Looking down on the forecastle deck, stem, scroll-ornamented trail boards, and bowsprit



Bulwarks may be set into rabbets or merely nailed on the deck



and set them in a rabbet cut in the side of the hull and extending about  $\frac{1}{4}$  in. into the poop and forecastle pieces. The forward ends of the bulwarks may need steaming before they will bend into place.

From the top of the bulwarks, cut in the gun ports as shown on the sheer plan.

A strip of chair maker's or caning spline about  $1/16$  in. square, or bamboo or other flexible material, makes a good molding along the deck line because it will bend from the stem to the stern, right around the stern. Steamed pine, however, will do if nothing better is at hand. Glue and nail it with the points of ordinary  $\frac{1}{2}$ -in. bank pins (lills). Cut off and discard the unused portion of the pins. You will find these short, thin pins are useful for much of the nailing required.

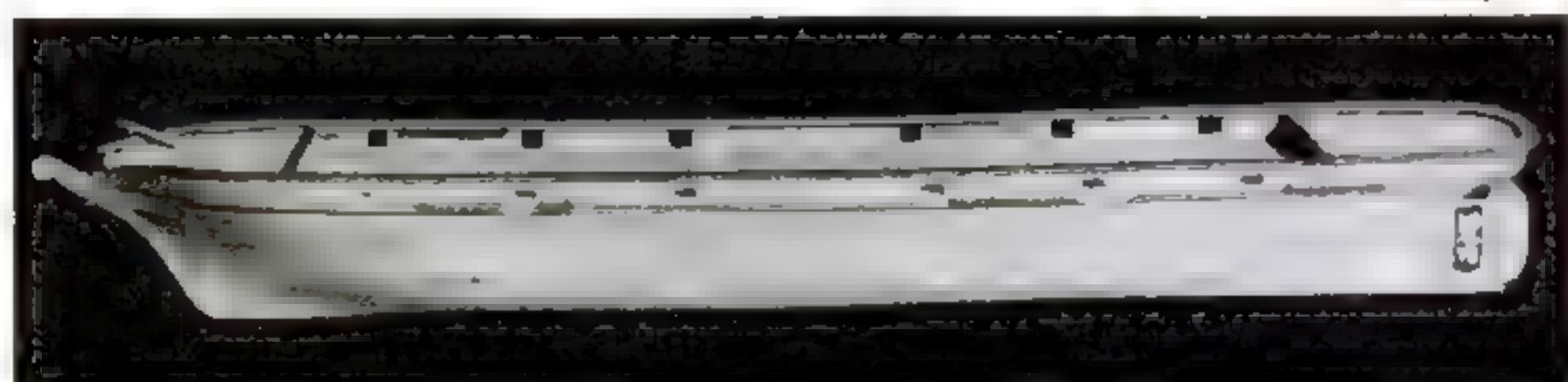
The main rail which goes on top of the bulwarks is continued to serve as a covering board along the edges of the forecastle head and poop. Make it about  $1/16$  by  $\frac{1}{4}$  in. The extreme ends are trimmed to shape and the whole is firmly glued and nailed.

English ships usually showed a lot of varnished teakwood, so I have made the main rail, poop handrail, fife rails, pin-rails, bulkheads, wheels, skylight, and gratings all "bright"—that is, varnished rather than painted. Gumwood looks much like teak, as does holly or white-wood if stained brown.

(TO BE CONTINUED)

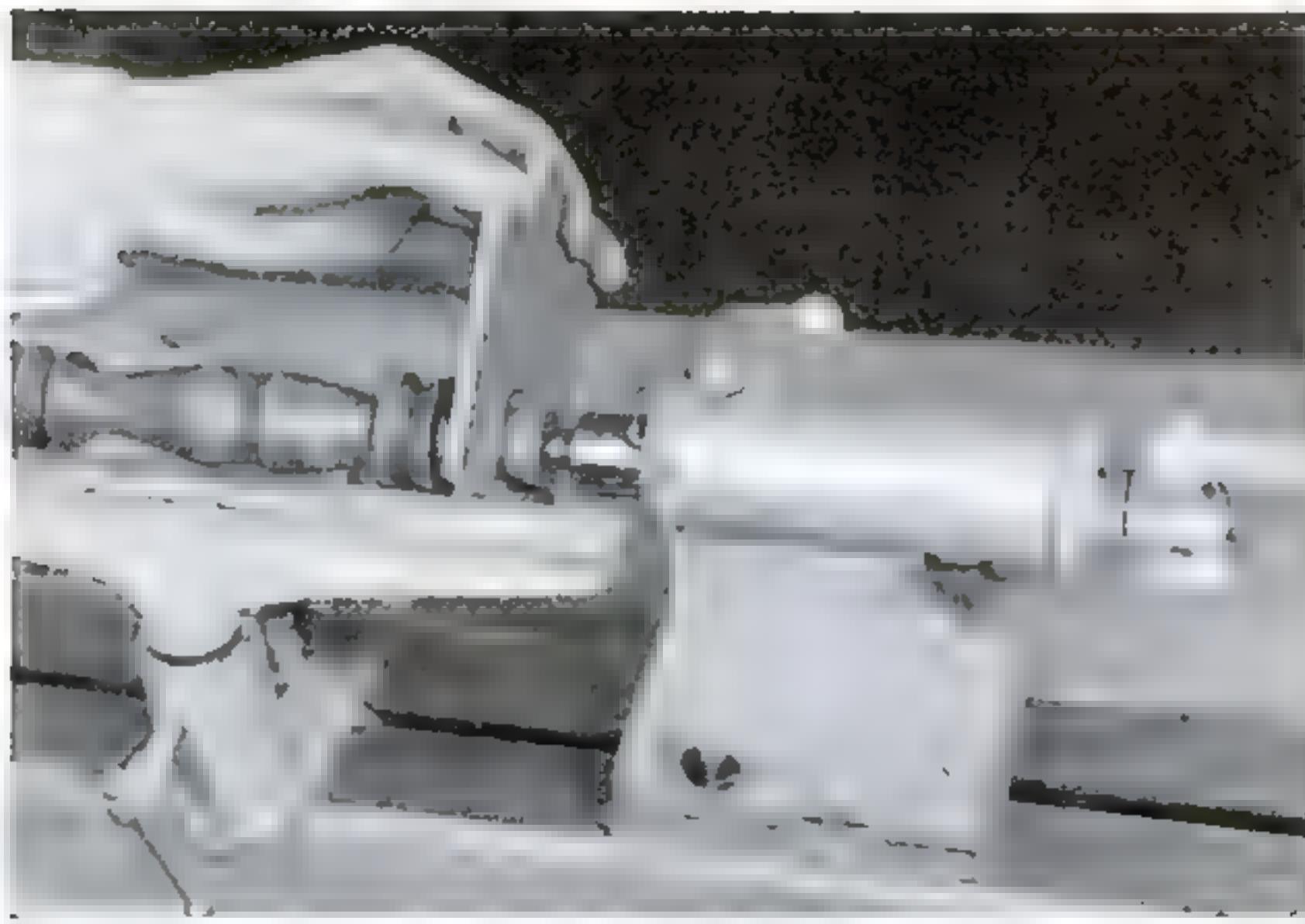
MATERIALS FOR HULL		
SOFT PINE		
No.	Dimensions	For
5	$7/16 \times 3\frac{1}{4} \times 21$	A, B, C, D, E
1	$7/16 \times 3\frac{1}{4} \times 7$	F, G
GUMWOOD OR OTHER SEMIHARDWOOD		
1	$\frac{1}{8} \times \frac{1}{8} \times 21$	Keel
1	$\frac{1}{8} \times \frac{1}{8} \times 8$	Stem, sternpost, sternpost frame, rudder
2	$5/32 \times \frac{7}{8} \times 20$	Bulwarks
2	$1/16 \times \frac{1}{4} \times 24$	Main rail
1	$1/16 \times 3 \times 3\frac{1}{2}$	Poop-deck rail, trail boards, etc. (3-ply)
1	$3/32 \times 3/32 \times 4$	Headrails
2	$1/16 \times 3/32 \times 20$	Waterways (also trestletrees, cross-trees)
1	$\frac{1}{8} \times \frac{1}{8} \times 6$	Poop and forecastle bulkheads
1	$1/16 \times 3/16 \times 8$	Covering boards for bulkheads, etc.
MISCELLANEOUS		
2 pc.	spline, bamboo, or other flexible material $1/16 \times 1/16 \times 24$	for deck-line molding.
Assortment of $\frac{1}{2}$ -in. pins (lills), large pins, nails, scraps of sheet metal, glue, cement, plastic composition wood. Black, white, yellow ochre, burnt sienna, Indian red, and emerald green paint; brown stain; varnish.		
NOTE: All dimensions are given in inches.		

Below, the hull with stem, bulwarks, main rail, and other parts. At right, the stem and keel



# Wood-Turning Gauges

SPEED UP YOUR LATHE WORK



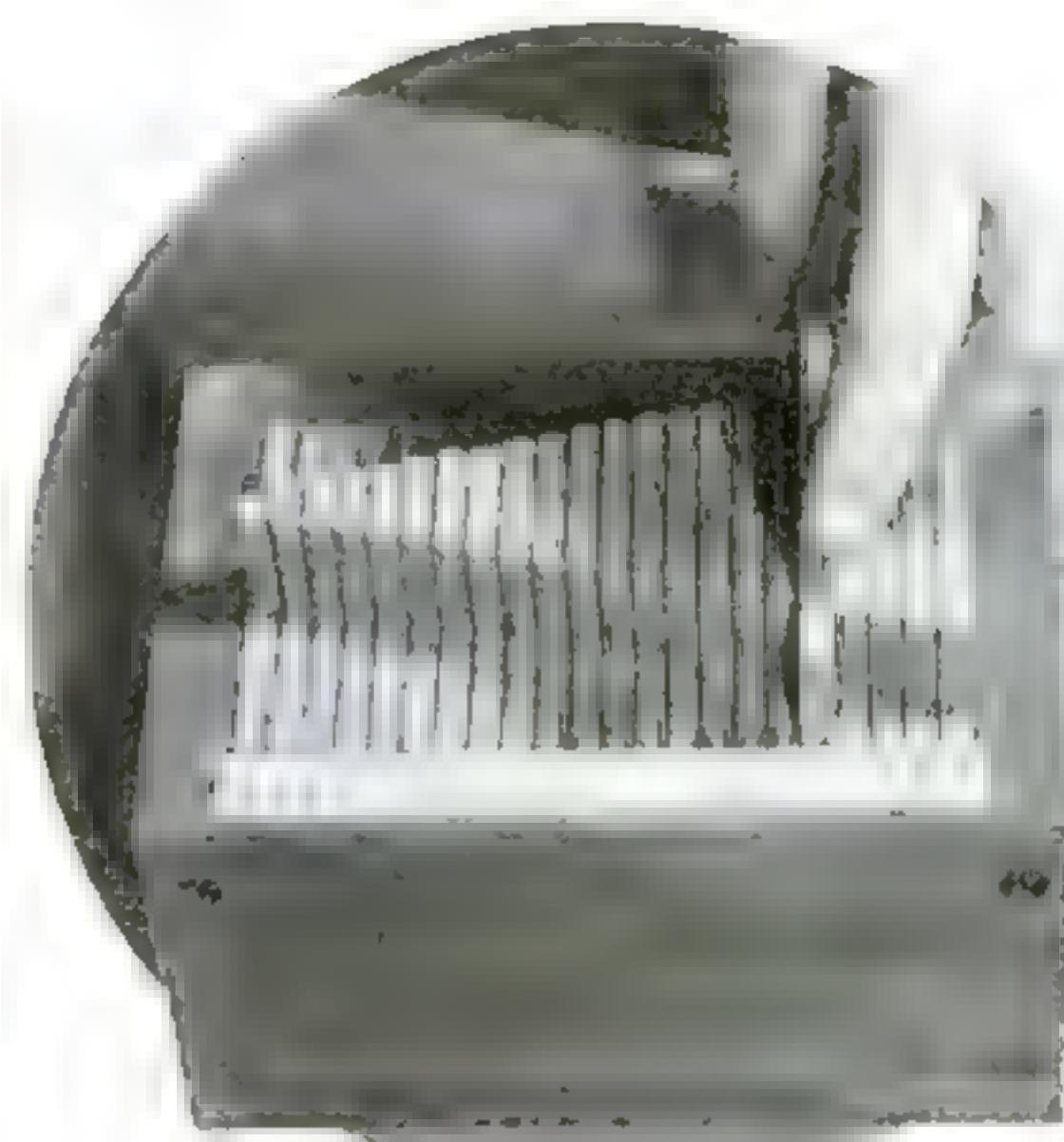
By HOWARD R. HEYDORF

EVERY wood turner grows weary in time of continually setting the calipers to test the spindle sizes. Some craftsmen set a number of calipers to the required sizes and keep them in a partitioned box ready for use. Because of the expense of this method, the writer designed the wooden gauges illustrated. One end of each is used as a diameter gauge, and the other end serves as a plug gauge of the same size for testing the size of holes.

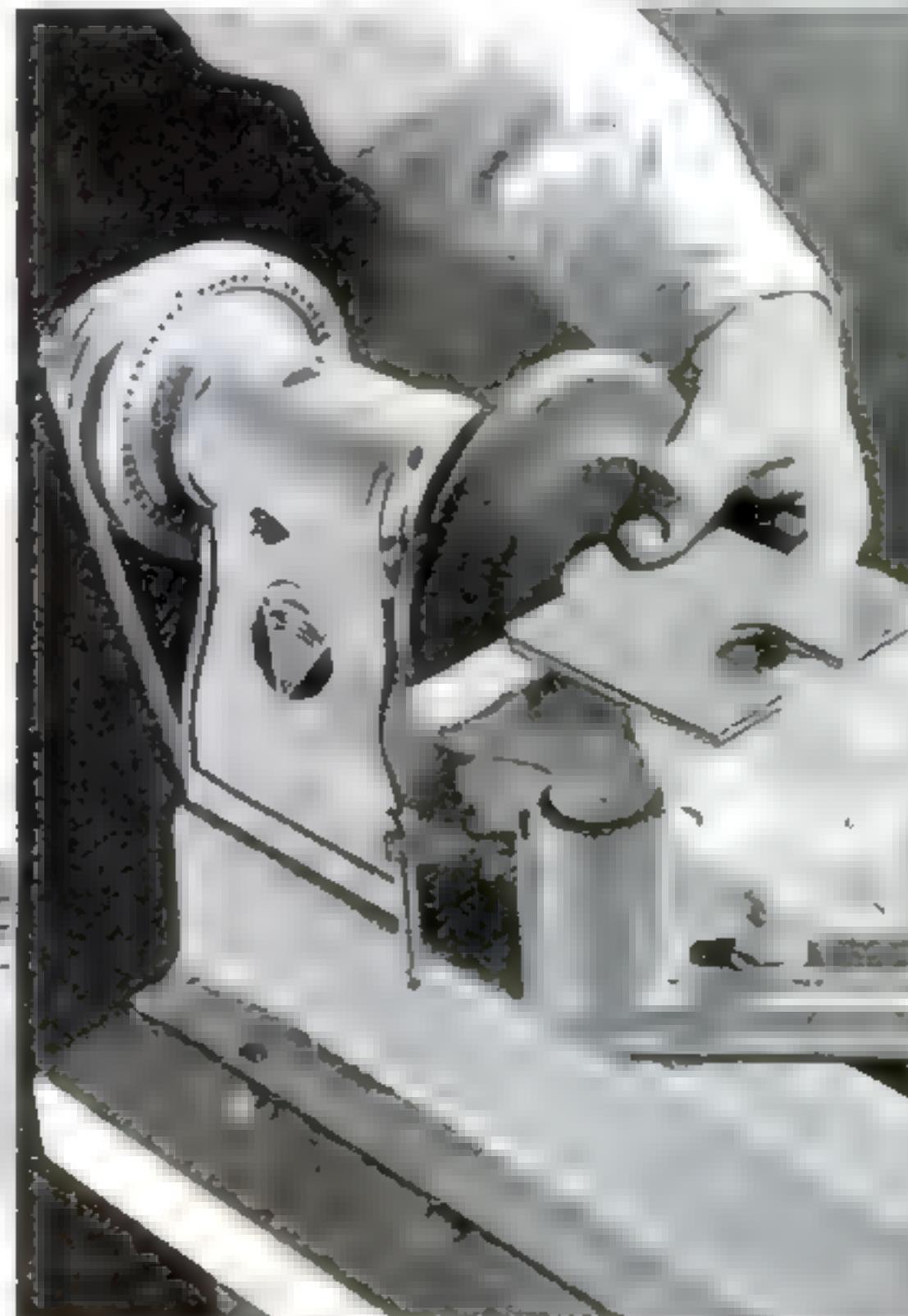
The gauges are made from  $\frac{1}{4}$ -in. plywood,  $3\frac{1}{2}$  by  $4\frac{1}{8}$  in. Waste wood is removed with a circular saw. An extension block is clamped to the miter gauge to give ample support

The gauges are constructed as shown. They are sanded smooth, and the edges of the plug are slightly rounded. Two coats of boiled linseed oil give a durable finish.

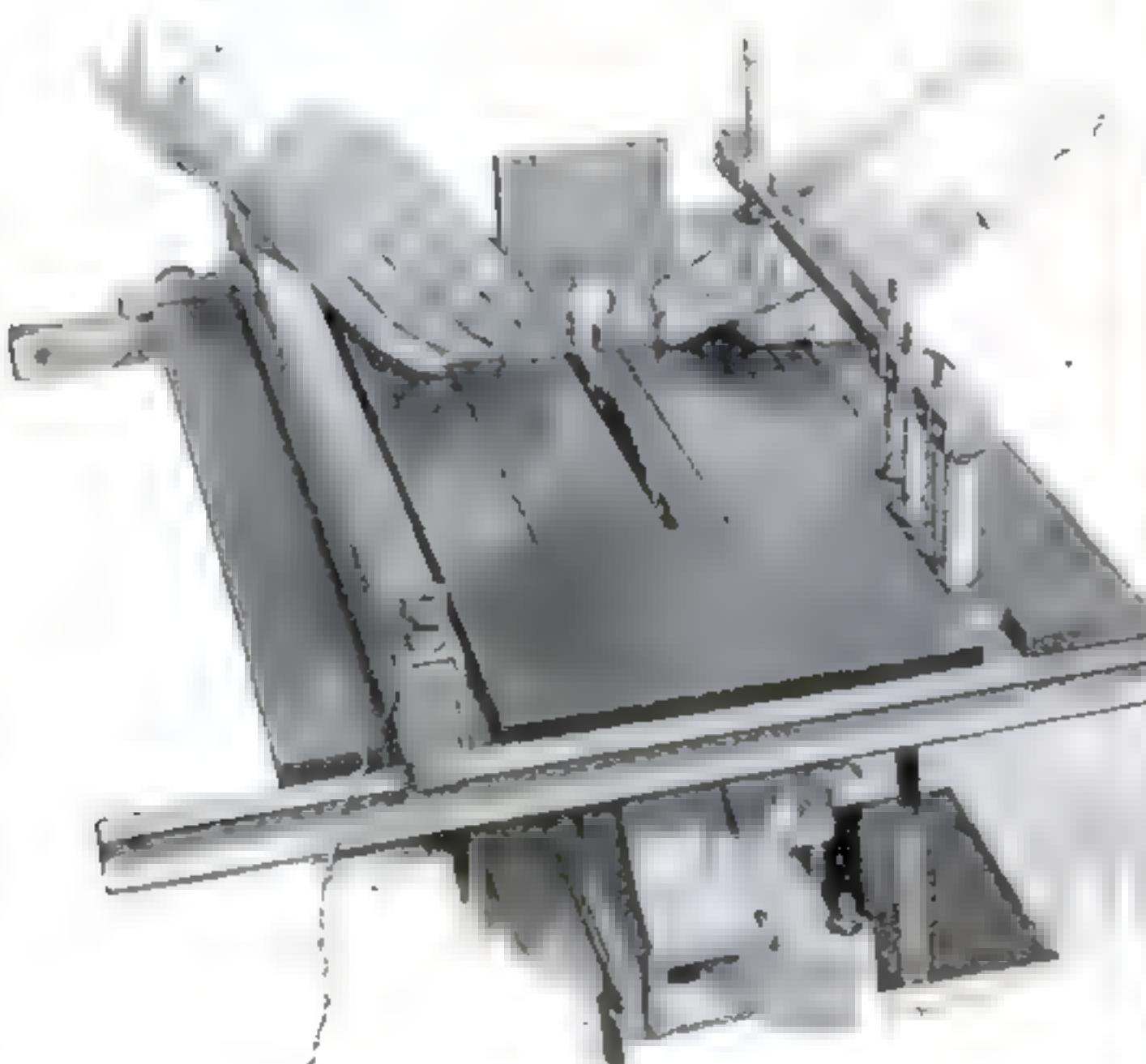
For convenient use, the gauges are kept in a case of  $\frac{1}{2}$ -in. thick wood, fastened together with screws and fitted with a cover, if desired. A  $\frac{1}{2}$ -in. wide strip of white celluloid is fastened to the top of the case as shown, and the sizes marked with black India ink.



Set of gauges ranging from  $\frac{3}{8}$  to 3 in. in  $\frac{1}{16}$ -in. steps. For  $1/16$ -in. sizes, the next larger gauge is used with  $1/16$ -in. clearance

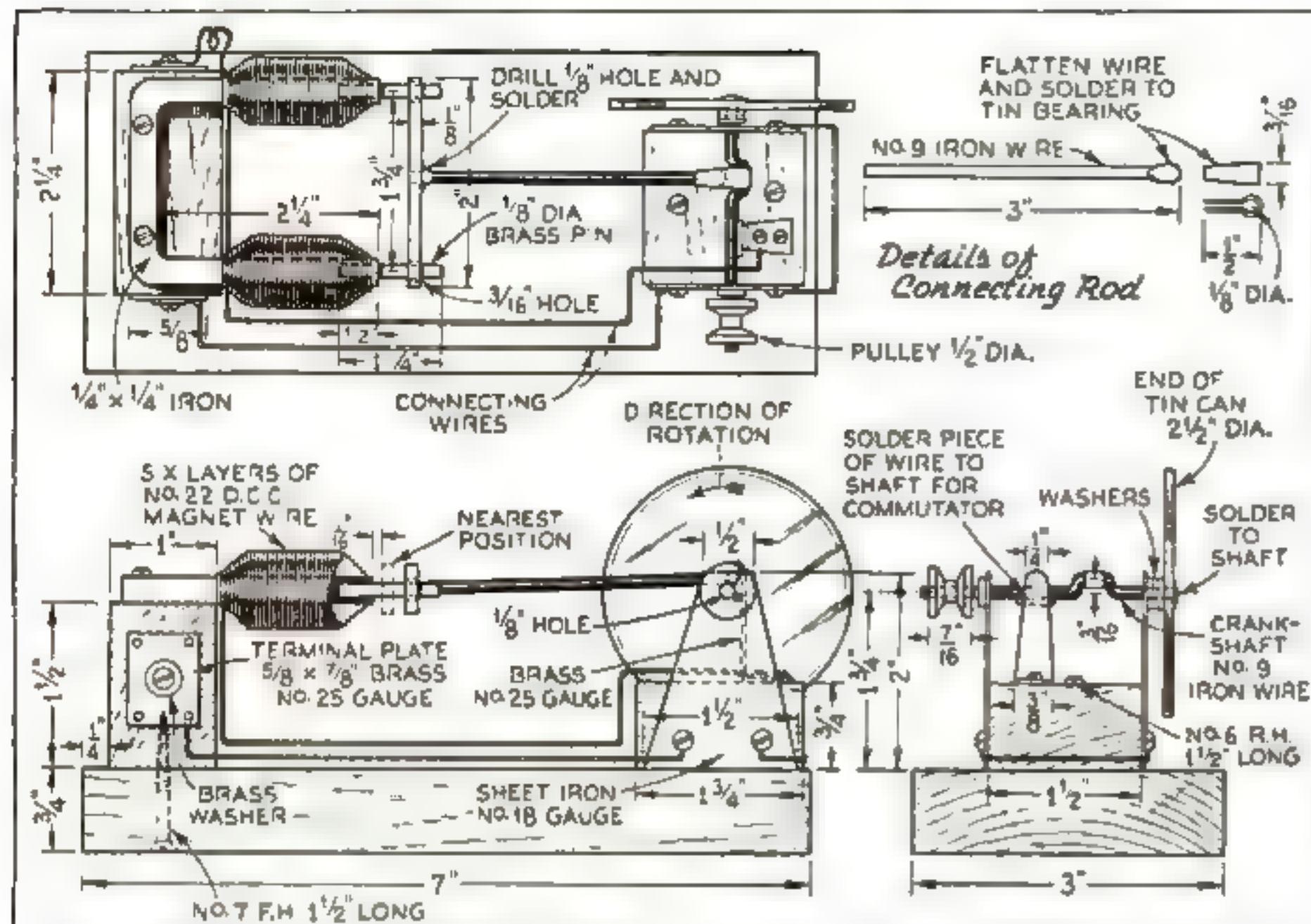


The larger holes are bored with an expansive bit from one side until the cutter bites into the wood. The block is then turned over and clamped to scrap wood for finishing the hole



Testing the size of a hole in a turning with the plug end of a gauge. This end is 1 in. long and the same width as the diameter-gauge opening at the reverse end

# ELECTROMAGNET OPERATES Toy Stationary Engine



Top, side, and end views of the engine. The commutator and brush are arranged to make contact just after crank passes dead center as armature moves toward magnet

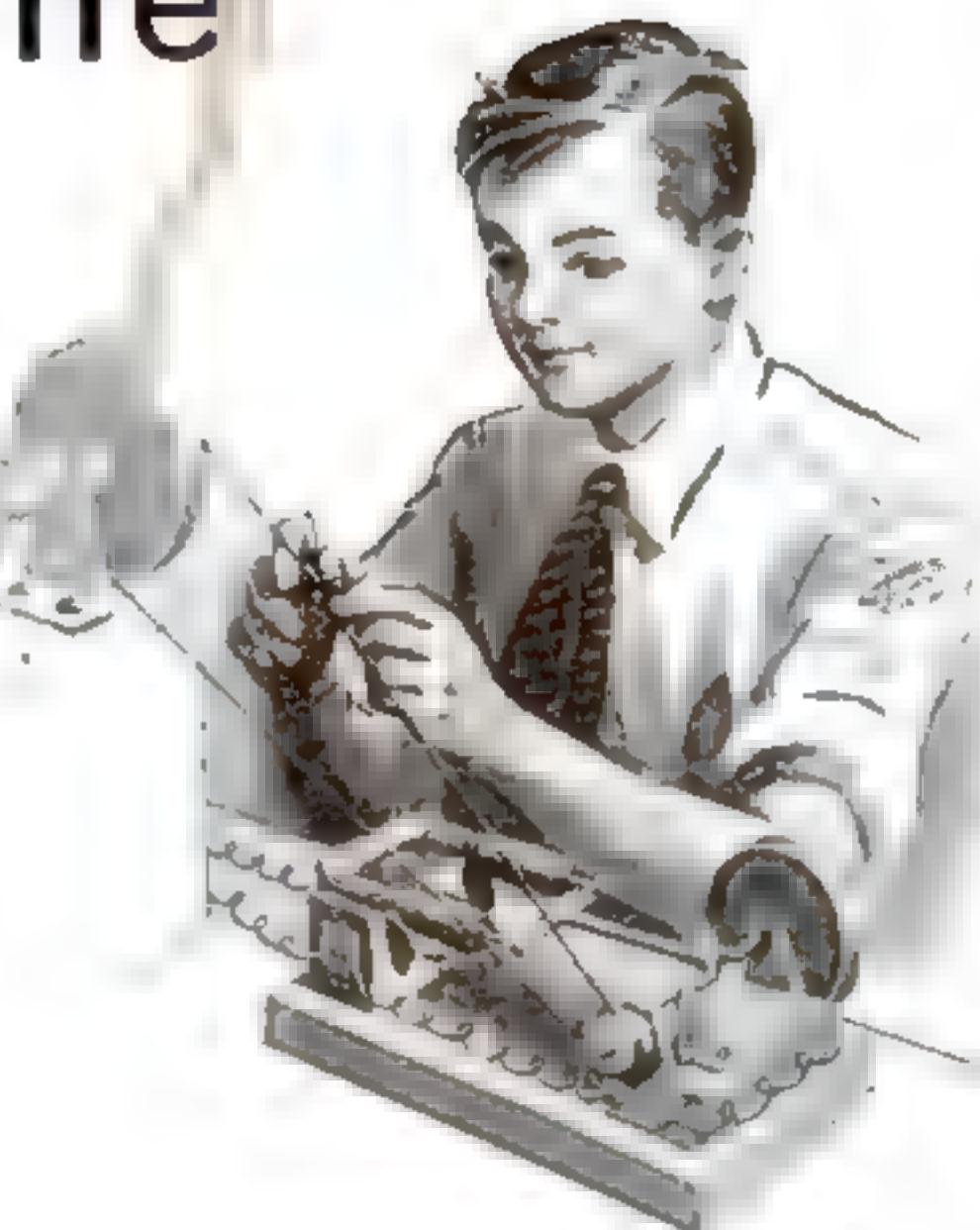
**O**F UNUSUALLY simple construction, this small toy electric engine with its twin magnet coils and long connecting rod, bears a resemblance to the steam stationary engines seen in power plants. It runs on two dry cells.

**Magnet.** Bend a  $6\frac{1}{4}$ -in. piece of  $\frac{1}{4}$ -in. square soft iron to form the core. Drill two  $\frac{1}{8}$ -in. holes for mounting to the block and another  $\frac{1}{8}$ -in. hole  $\frac{1}{2}$  in. deep in each end for the brass armature guide pins, which are driven in place. Wrap ends of core with layer of

tape or paper. Wind six layers of No. 22 magnet wire as shown, allowing 8 in. of wire at each end. Shellac thoroughly.

**Armature.** Make rod and bar from No. 9 iron wire and band iron  $\frac{1}{8}$  by  $\frac{1}{2}$  by 2 in. Flatten shaft end of rod to take a bearing made from tin. Solder other end of rod in hole in band iron.

**Shaft.** Bend a  $2\frac{1}{2}$ -in. piece of No. 9 wire to have a  $3/16$ -in. crank as shown. Solder a  $\frac{1}{8}$ -in. piece of wire to shaft so it will begin to make contact with the brush as shaft revolves toward



The engine is used to drive light toy machines

magnet and crank has just passed dead center. Place bearing on shaft crank and solder to flattened end of rod.

**Assembly.** Mount magnet block on base and magnet on block. Assemble bearings, washers, and shaft, and mount on block. Solder tin-can flywheel to end of shaft with dowel pulley on other end. Arrange on base so there is  $1/16$ -in. space between armature and magnet ends when crank is in nearest position. Connect one end of magnet winding to brush; connect other end to one terminal. Connect other terminal to both shaft bearings. Adjust brush so it rides lightly yet firmly on shaft contact. The circuit should be broken when armature is moving away from magnet. Use light oil on bearings.—E. A. RERUCHA.

## Mounting a Magnifier on Spectacle Frame

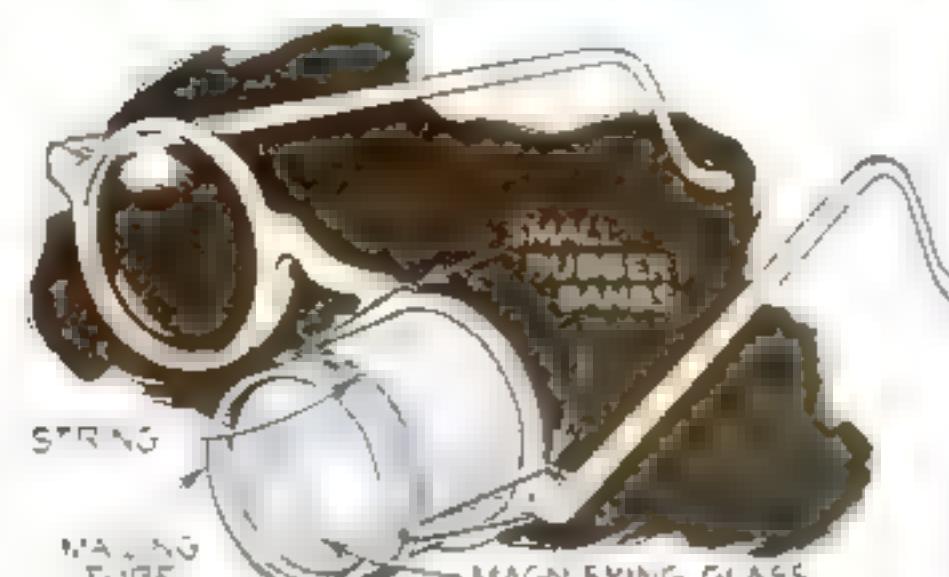
A MAGNIFYING glass mounted in a short length of mailing tube and clipped to one lens of an ordinary pair of spectacles with two small rubber bands will enable the outdoor student to examine objects, yet leave both hands free for action. One illustration shows a man examining bees on the comb under the magnifying glass.—WALTER H. HULL.



The flat hammerhead slides over the work

## Flattened Tack Hammer Is Aid in Glazing

WHEN much picture framing or window glazing has to be done, the work can be facilitated by grinding or filing the head of a tack hammer flat on one side as shown above. This makes it much easier to drive the brads or glazing points.—OLIVER BANDELIER.



When the magnifying glass is fastened in this way, it leaves the user's hands free



## RECORDS BROKEN IN 1937

- NEW CLUBS** . . more than 100 organized.
- INDIVIDUAL AFFILIATE CARDS** . . 2,572 more issued than in 1936.
- SERVICES** . . . 10 monthly bulletins and 15 job sheets containing 28 working drawings sent to each club.
- PROGRAMS** . . 5 outlines for special meetings furnished to all club secretaries.
- INSTRUCTIONS** . . detailed bulletins issued on publicity, club libraries, and program material.
- INFORMATION** . . 507 more letters requesting aid in starting clubs answered than in any previous year.

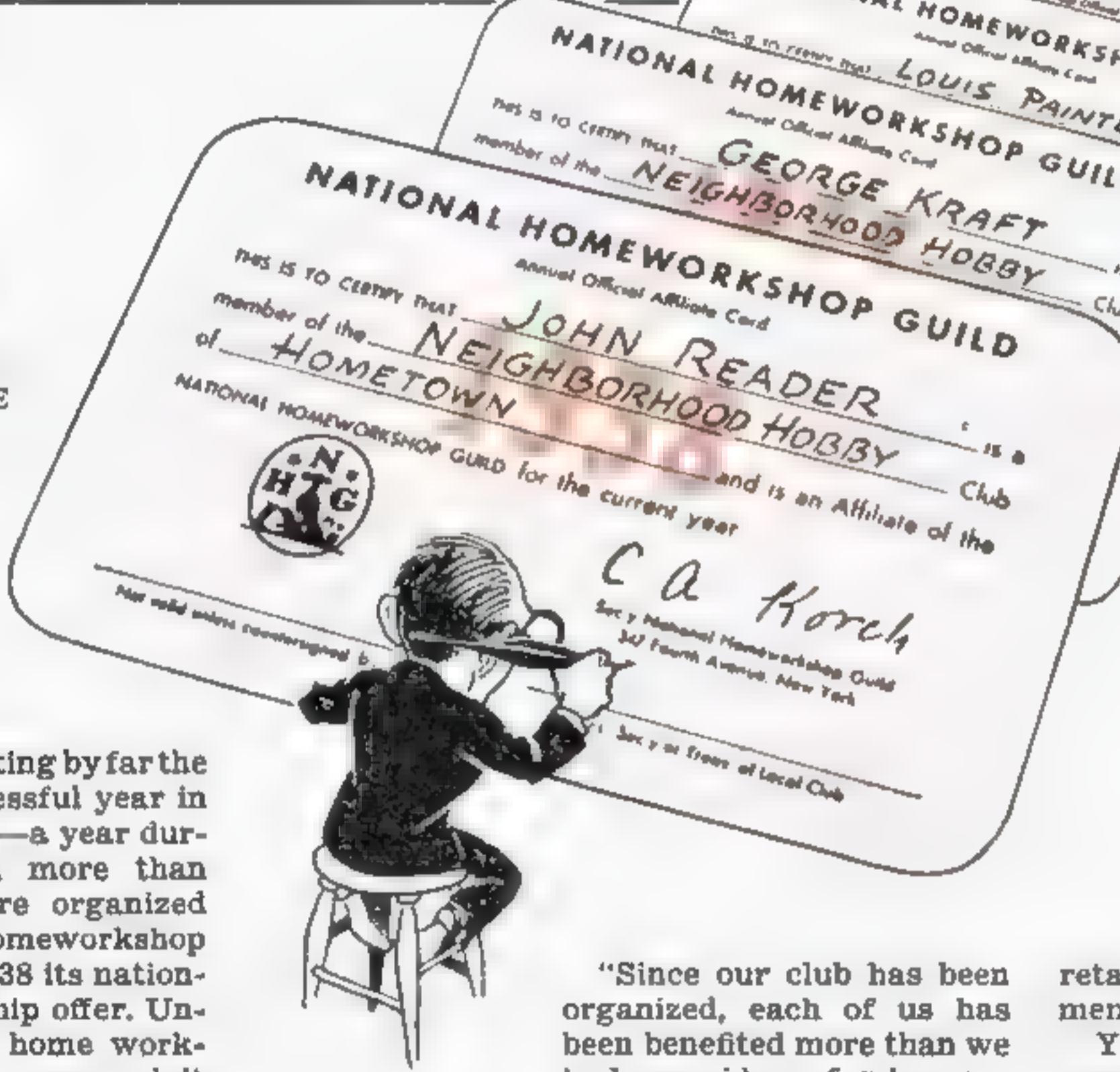


Official Magazine  
POPULAR SCIENCE  
MONTHLY

AFTER completing by far the most successful year in its history—a year during which more than 100 new clubs were organized—the National Homeworkshop Guild renews for 1938 its nationwide free membership offer. Under this plan, any home workshop club of five or more adult members may obtain a charter and receive many subsequent benefits (see P.S.M., Oct. '37, p. 101). The Guild is a nonprofit, noncommercial organization founded for the sole purpose of promoting the home workshop club movement and pledged to make no charges whatever for initiation fees or membership dues, now or hereafter.

Records in every division of Guild activities were broken in 1937. As summarized above, the statistics show at a glance that more and more home workshop enthusiasts are realizing the value of membership in a club devoted exclusively to mechanics and craftwork.

You cannot, of course, join the Guild as an individual, because one of the Guild's main objectives is to foster direct fellowship among amateur craftsmen, and it has been found that the best way to do that is to encourage them to meet in local groups.



"Since our club has been organized, each of us has been benefited more than we had any idea of when we started," Donald W. Fraser, president of a club in West Lynn, Mass., wrote to Guild headquarters recently. Many others have expressed their appreciation, and phrases from a few of the letters follow:

"We fully realize the benefits of belonging to a club where one can find an outlet for his hobby."—William T. Russell, Bucksport, Me.

"Our members greatly appreciate your coöperation and look forward to the Guild bulletins each month."—Carl Zehr, Ashtabula, Ohio.

"Your lists have been very helpful."—John F. Smith, Orange, N. J.

"Every one of us appreciates what your Guild means and does for clubs throughout the United States."—Bernard V. Jackson, Sioux City, Iowa.

"The success of our club should go on record as a Guild accomplishment."—Walter Modesto, New Bedford, Mass.

# Guild Adds Another 100 Clubs

## RENEWS FREE MEMBERSHIP OFFER FOR 1938



"You are doing fine things for the home craftsmen, and we are with you in any undertaking."—William M. Hamrick, Fairmont, W. Va.

The annual affiliate cards, similar to those illustrated, are now recognized as passports to fellowship with craftsmen everywhere. Thousands of the 1938 cards have already been sent to club secretaries for distribution among the members.

You and your friends can become members of the Guild by starting a home workshop club in your neighborhood. Use the coupon below or, if you prefer, write a letter.

### National Homeworkshop Guild 347 Fourth Avenue, New York

Please send me complete information about your free membership plan. I am anxious to belong to the National Homeworkshop Guild and believe that a club can be started in my neighborhood.

For your use in sending me this material, I am inclosing a large (legal size), self addressed, stamped envelope. I understand that this will not obligate me in any way.

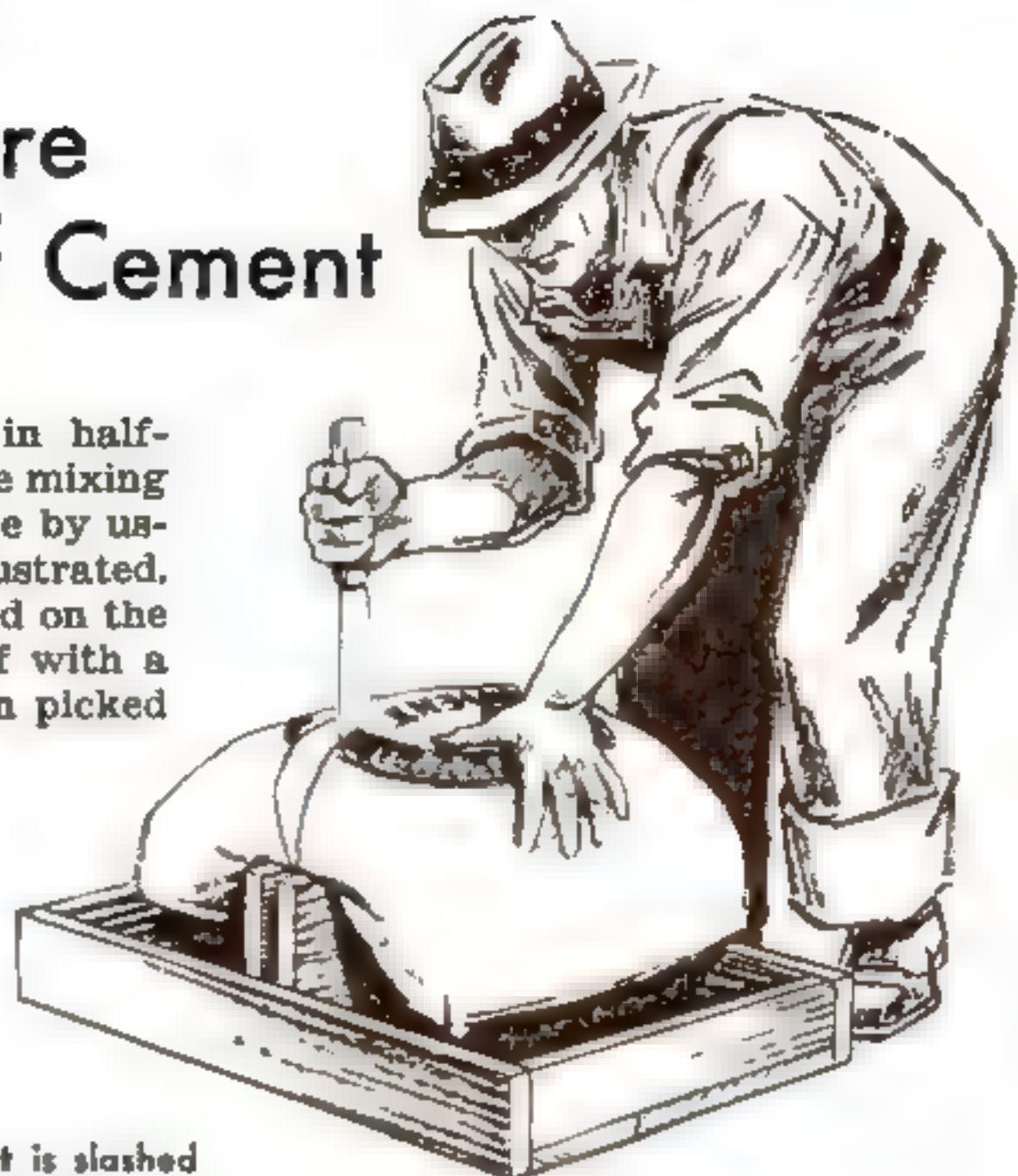
NAME \_\_\_\_\_

ADDRESS \_\_\_\_\_

CITY ..... STATE.....  
(Please print very clearly)

## A Quick Way to Measure Half Bags of Cement

**TO MEASURE** Portland cement in half-sack quantities for a small concrete mixing machine, one contractor saves time by using a dividing board of the type illustrated. A paper sack of cement is balanced on the two center boards and cut in half with a long knife. Each half sack is then picked up as needed and emptied into the mixer. No shoveling is necessary except to scoop up the small quantity of cement that is spilled into the wooden box each time a bag is cut in half.—G. E. HENDRICKSON.



### Frame Holds Toy Wheels for Truing Spokes

THE work of truing up the spokes of a child's velocipede or inserting all new ones is much easier if a frame is made from a piece of flat iron to hold the wheel. It is bent as shown, and the ends notched.—WALT MESSENGER.

### Ruler Kept Handy on Rings of Loose-Leaf Binder

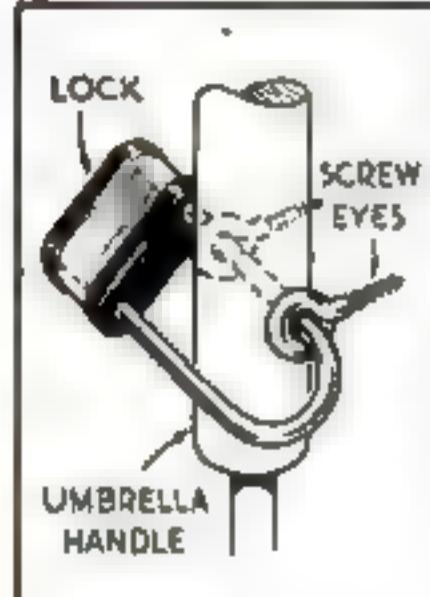
STUDENTS who find it necessary to keep a ruler always at hand in the classroom can do so by carrying it in a loose-leaf binder. Drill holes in the ruler sufficiently large so they can be slipped over the binder rings as shown at right.—R. D. KERSHNER.



### Padlock Safeguards an Umbrella

ANY man who finds it convenient to keep an umbrella in his shop or place of business, but objects to having it "borrowed" during his absence, can easily lock it by the method illustrated at the left.

Set two stout screw eyes into a wall, desk, cabinet, partition, or other available surface, placing them just far enough apart so that the umbrella handle fits snugly between them. Drill a hole through the handle and slip a padlock through the hole and through both screw eyes. The end of the ferrule may be supported in a pipe strap. This is desirable because it prevents any undue strain on the handle.—BERTRAM BROWNOLD.



The handle of the umbrella is held in place by a padlock, and the lower end fits in a pipe strap

### A Low-Voltage Splice

IT IS sometimes necessary in low-voltage wiring, such as bell work, to splice the wires. Although it is best to solder the splice, a good substitute is to wrap a piece of tin foil over the well-cleaned joint and follow this with a layer of tape. The tin foil will prevent the tape from turning the wires black and lessen the likelihood that the joint will develop high resistance and become a poor conductor. Wrap the splice tightly.—HAROLD P. STRAND.



### Cords Aid in Removing Stubborn Screw Caps

DELAY and annoyance are often caused by the difficulty of loosening the screw tops of varnish and liquid-glue cans, not to speak of mayonnaise jars, fruit jars, and similar food containers. Many devices for unscrewing the tops are sold, but one may not be on hand when needed. In this case, two cords may be looped around the cap and jar as shown below.

If the top is particularly stubborn, each cord should be wrapped around about two more turns than shown, and the free ends twisted around a screw driver or a short stick to give a better grip. If the cords slip, apply friction tape before putting them on. Heating the cap just before the cords are pulled will aid considerably in loosening it in many cases.—I. W. DICKERSON.



Two cords are looped in reverse directions around the cap and jar to give a good grip

### Flexible Conduit Clears Clogged Sink Drains

A PIECE of flexible electric conduit or BX can be used successfully to remove obstructions from sink drains. The cable can be worked past any sharp bends that are encountered and will bore its way through caked grease and other ordinary obstructions.—D. STUART.

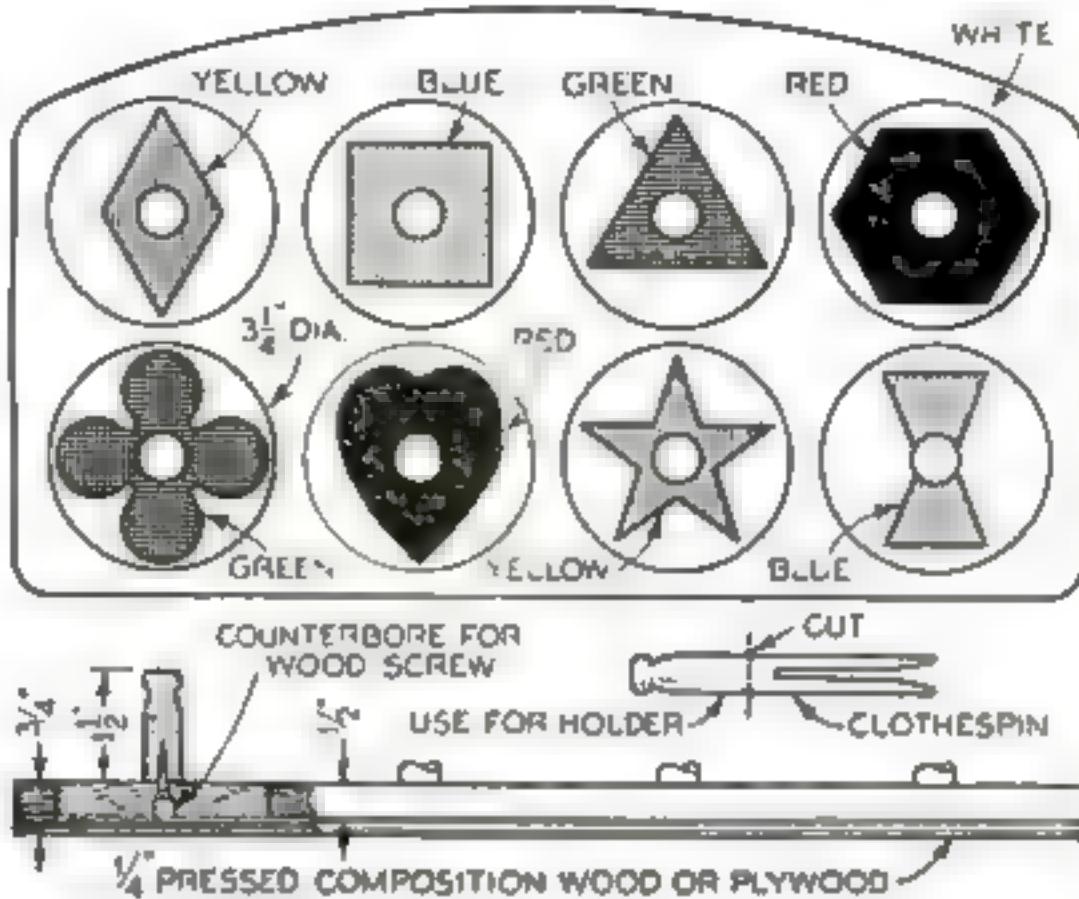
# Block-Fitting Toy

## TEACHES SHAPES AND COLORS



The blocks are jigsawed to the shapes shown at the right. Each is given a distinguishing color and placed in a painted circle of the same color

MANY hours of constructive play are in store for any child of from one to two years old who is given a toy like that illustrated. In fitting the various colored blocks into their holes, he will learn discrimination in size, color,



and position. The cost is negligible.

The main portion of the toy was jigsawed from the end of an orange crate to fit the tray of the child's chair. After the square, triangle, and other figures had been carefully sawed out, a piece of pressed composition board was tacked to the bottom to prevent the blocks from falling through. The upper part of a clothespin was then screwed to each block as shown to serve as a handle.

The whole set was given a ground coat of white enamel; when this was dry, each block, the inclosing circle, which is merely painted on, and the hole were given its own particular distinguishing color. The handles were all left white for the sake of contrast. Of course, nonpoisonous finishes should always be used.—M. E. NIXON.

## A Collapsible Reel for Winding Wool

THIS simple folding reel enables knitting wool to be unwound from the skein with maximum ease and freedom from tangles.

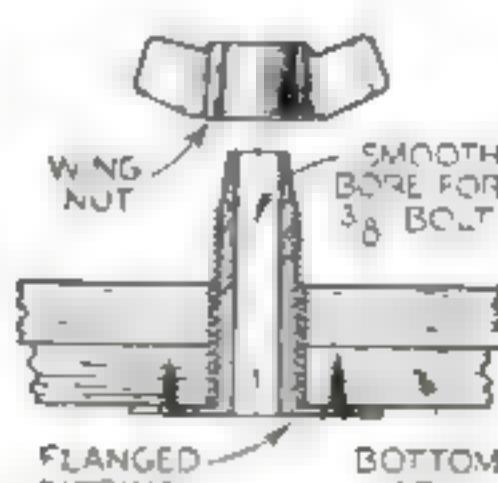
From a length of pine strip,  $1\frac{1}{4}$  by  $\frac{3}{8}$  in., saw out the two arms to the shape shown, each 26 in. long. Cut two more pieces from the same stock, each 7 in. long, for the jaws of the table clamp. Bore the arms near their ends to take four pieces of  $\frac{3}{8}$ -in. doweling about 5 in. long to form pegs. A small flanged gas fitting or something similar, threaded on the outside and with a smooth bore to fit over a  $\frac{3}{8}$ -in. bolt, is

used with a wing nut as shown to clamp the two arms together at their centers. Loosening the wing nut allows them to be opened and closed, scissors fashion. The pivot about which the whole assembly rotates consists of a  $\frac{3}{8}$ -in. bolt about 4 in. long with a nut run on to keep the top jaw of the table clamp in place. A wedge is used to tighten the clamp.

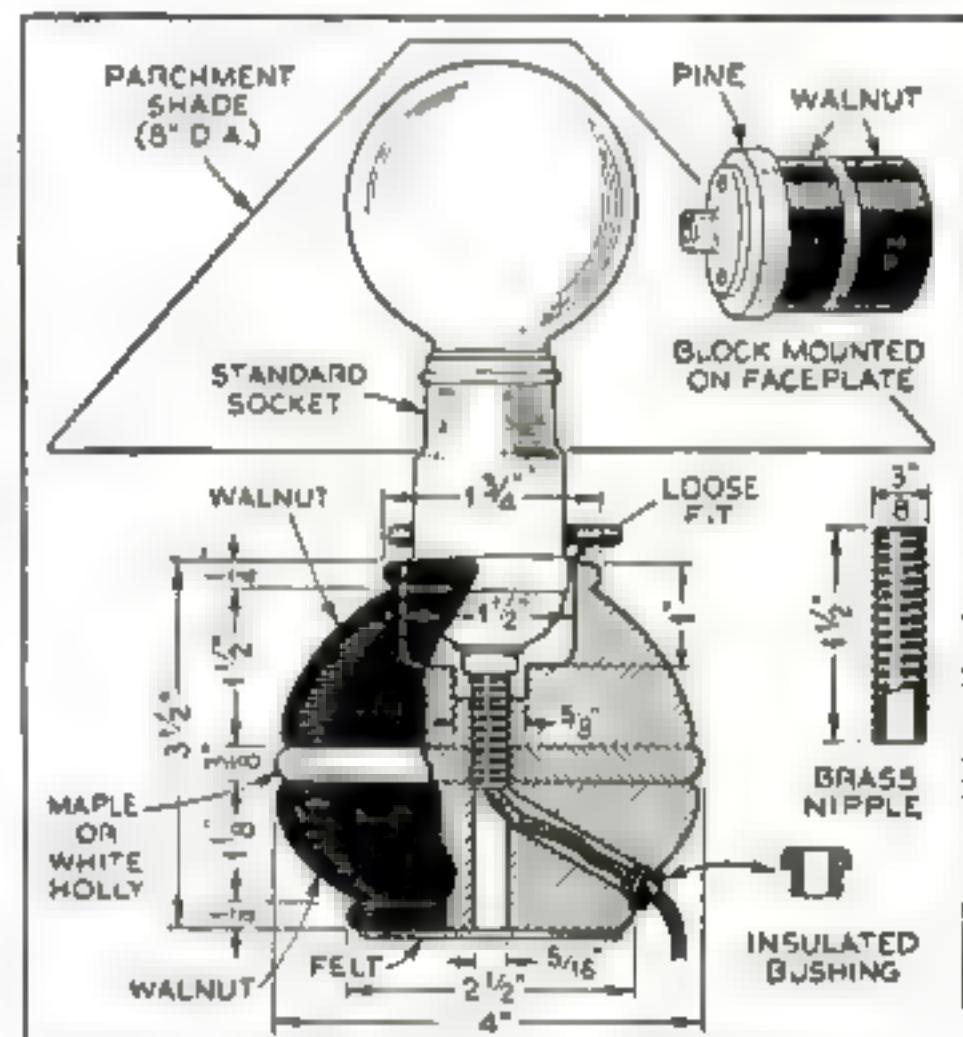
Close the two arms when placing the skein on, and then open them till the wool is taut. A turn of the winged nut will then hold them in this position.—A. MCLEOD.



In use, the wool winder is attached to a table top by inserting a wedge in the clamp. The skein is slipped over the arms, which are then opened until the wool is taut and held by tightening a wing nut. At right, the parts



The fitting and wing nut to hold the arms in the open position



## Turned Wooden Base for a Small Lamp

BLACK walnut with a layer of maple or white holly in the center forms the base of the diminutive but decorative lamp shown in the drawing above.

Glue the stock together, preferably first band-sawing the pieces roughly to a diameter of  $4\frac{1}{2}$  or 5 in.; then mount on a very small faceplate, and turn in the lathe. If the faceplate is too large, glue the walnut to a piece of  $\frac{3}{4}$ - or 1-in. pine with paper between, and attach the pine to the faceplate. Make the recess in the top a loose fit for the socket. Bore  $5/16$ -in. holes as indicated. French polish the piece while in the lathe or apply two coats of clear lacquer. Remove the work from the lathe, twist the threaded brass nipple into place, add the socket and lamp cord, and glue felt under the base. A suitable parchment shade may be purchased.—F. CLARK HUGHES.

# Gouge-Carved Borders

E. J. TANGERMAN  
demonstrates a simple way  
to decorate boxes, cabinets,  
book ends, and a variety of  
craftwork projects

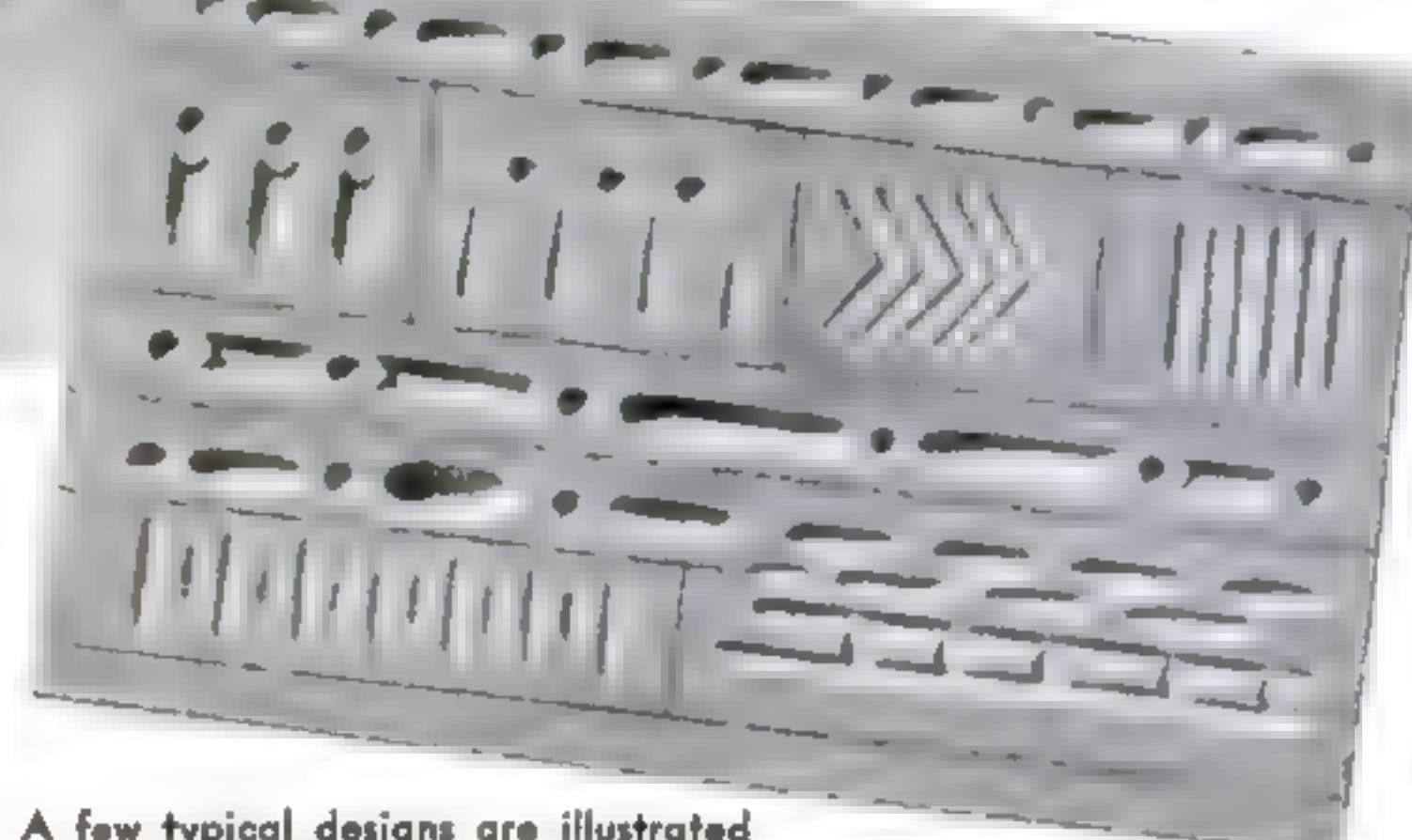
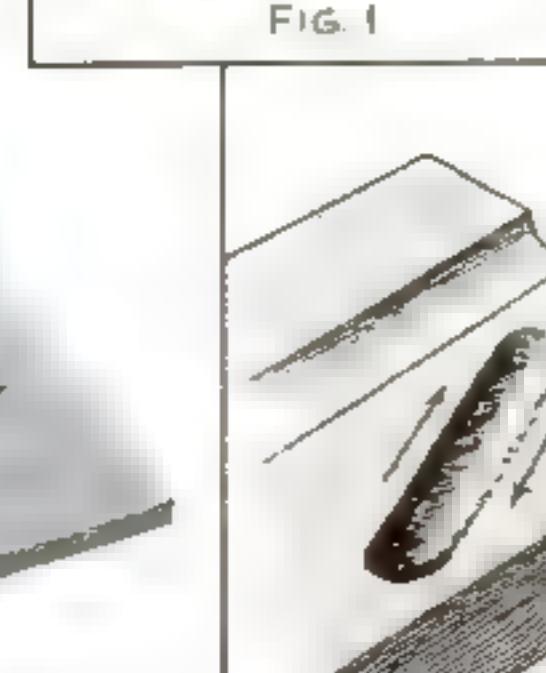
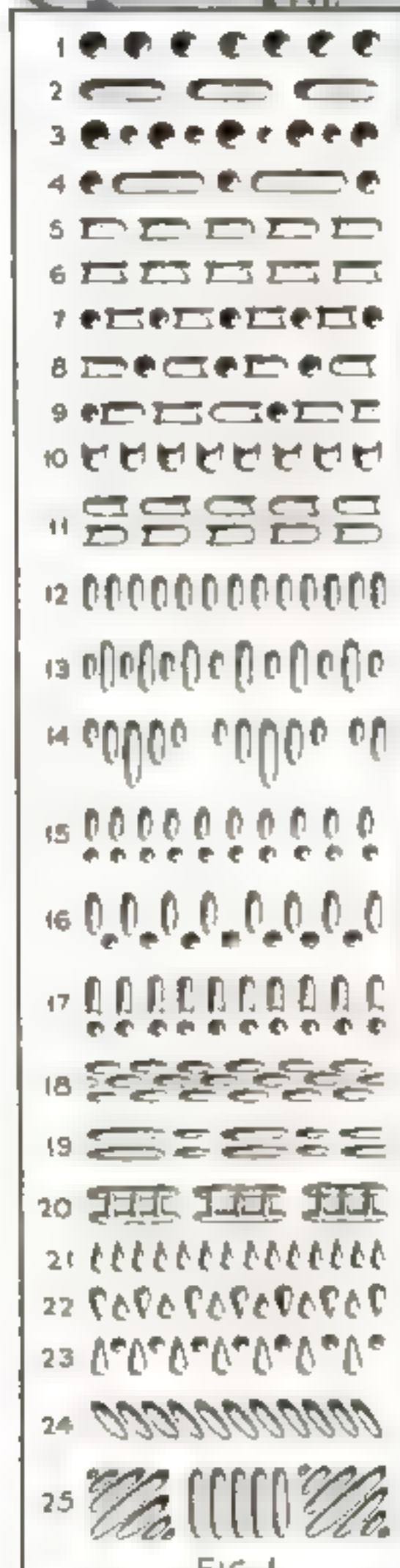
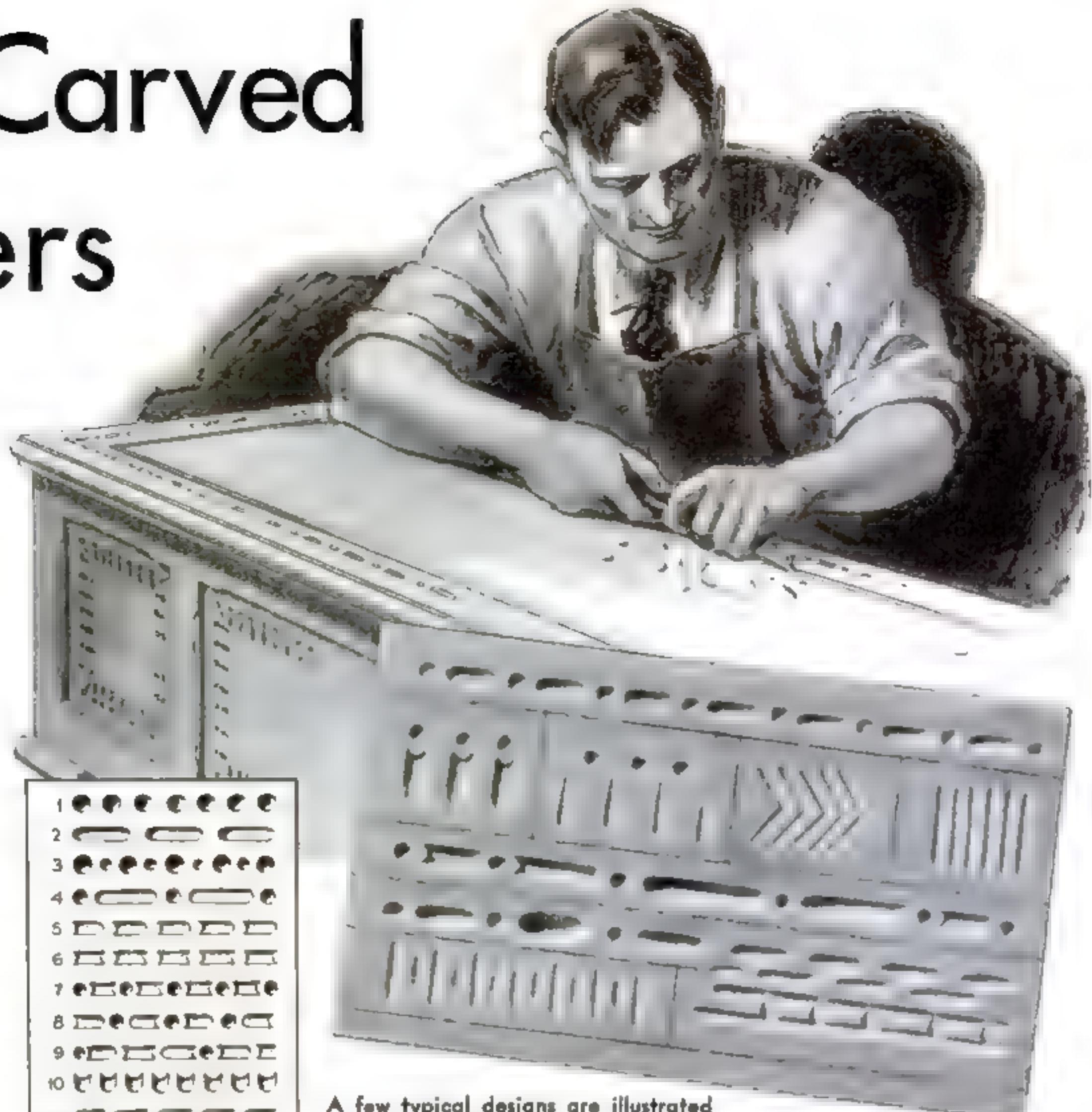
EVERY carpenter's kit includes a gouge or two—and sooner or later so does every householder's because the gouge is universally useful. It is also a most important wood-carving tool. Many of the craftwork projects you make can be decorated tastefully with the gouge alone, for it can produce an almost infinite number of patterns (Fig. 1).

For most work, I prefer a 3/16- or  $\frac{1}{4}$ -in. gouge of the half-circle type, sharpened on the outside and with the corners rounded as in Fig. 2. The wire edge created in sharpening is taken off with a little inside stoning with the round-edged stone called a "slip."

The basic design marked No. 1 in Fig. 1 is made by holding the gouge vertically over the piece, then pushing downward as the gouge is rotated. One gouge will create the continuous pattern, and gouges of two sizes can be used for design No. 3 and its many variations.

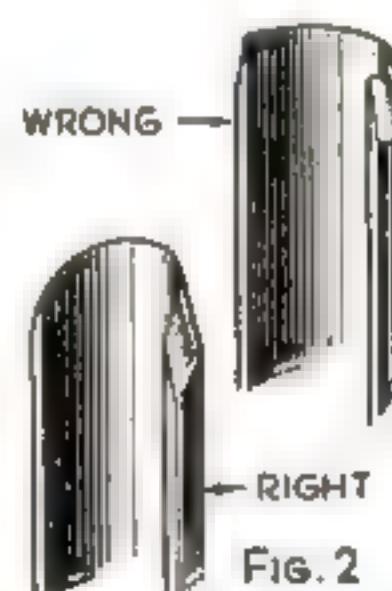
Other patterns are usually based on a slot with rounded bottom. To make it, the gouge is held in both hands as illustrated below, the right hand supplying the cutting force, while the left acts as a guiding, controlling and actually a retarding force to keep the tool from cutting too far. Another common grip is shown in Fig. 3.

A small gouge is accurately controlled by holding it as shown below. A grip for heavier work is sketched in Fig. 3



A few typical designs are illustrated above, and others in Fig. 1 at the left

When cutting diagonally across grain, the gouge cuts cleanly on the side cutting out of the grain, but the opposite side tears a little. In certain woods this tendency may be so strong that smoothing requires two opposed strokes of the gouge, as in Fig. 4.



For carving borders, a gouge of the half-circle type, beveled outside, is preferred

If you will make a shallow cut in the wood by pushing down on the tool handle at the same time as you push it ahead, the cutting edge will take out a chip that looks like the top part of an exclamation mark. Two of these cuts made so they run into each other form the basis of design No. 2 in Fig. 1. Pattern No. 6 is somewhat similar, except that the ends are shaped by forcing the tool down vertically so that it makes a half-moon or crescent-shaped cut. The groove itself is run into this crescent from behind by cutting up to the hump of the crescent, then swinging the handle of the gouge to each side in a wide arc so that the sides of the cutting edge cut out the corners as in Fig. 5.

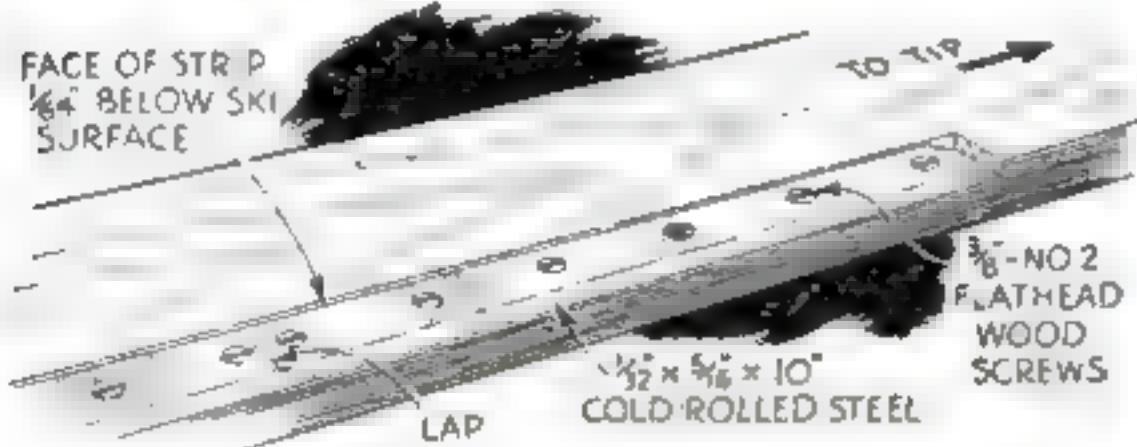
To avoid overcutting rock the cutting edge slightly as you push on the tool.



# WATERPROOFING AND METAL EDGES WILL MAKE Your Skis Last Longer



Scraping off old wax and dirt. Below, how a steel edge is applied, the size exaggerated for clearness



BY JULES E. ANDRE

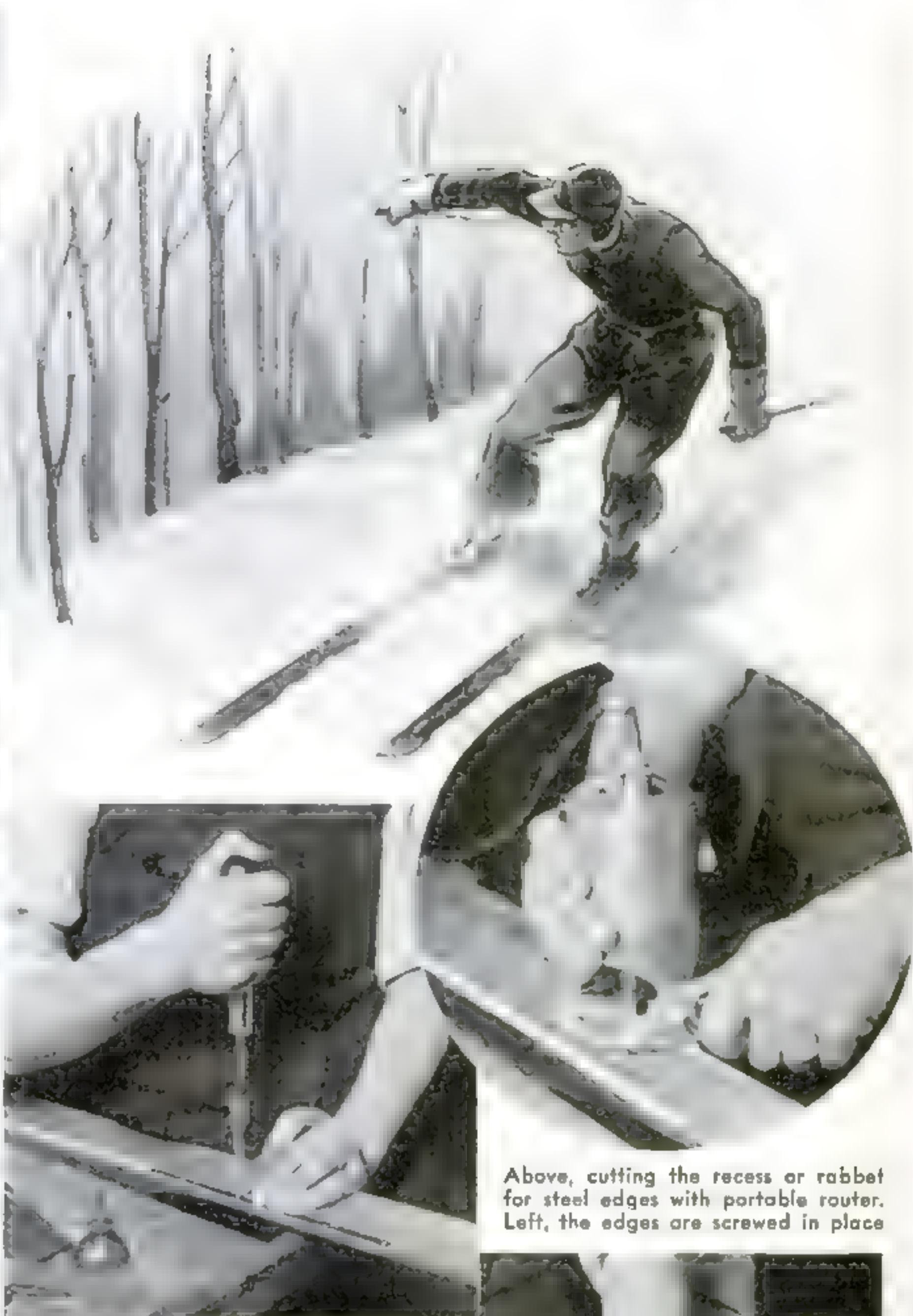
**N**O OTHER type of sport equipment is subjected to such strains and such adverse weather conditions as are skis. Any skier who expects his outfit to stand up under such punishment must take good care of it—or he will have to take the punishment himself. There is no difference whether the skis are the product of a world-renowned manufacturer or were made in your own workshop. Wood they are, and as such they need careful handling. By waterproofing them and applying metal edges, you will add several years to their life.

Skis should be made as waterproof as possible. The wood itself contains ten percent moisture on the average, and any scratch or nick will open the way for additional moisture, which causes

warping. Warped skis make control difficult on turns, and even on straight running they tend to turn without regard for the desires of the skier.

To waterproof the skis correctly, the top surface should be covered with a modern, waterproof, synthetic-resin base varnish (the manufacturer has undoubtedly seen to this if you have a commercial product) and the running surface impregnated with pine tar or covered with special ski lacquer (this you must do yourself). The pine tar can be obtained at a drug store or chemical supply house.

First clean the running surface very thoroughly. If the skis have been used previously, scrape off all the old wax with a ski scraper. The back edge of a plane iron (*Continued on page 116*)



Above, cutting the recess or rabbet for steel edges with portable router. Left, the edges are screwed in place



Synthetic-resin or celluloid strips are sometimes cemented to the leading edges

# CRAFTWORK

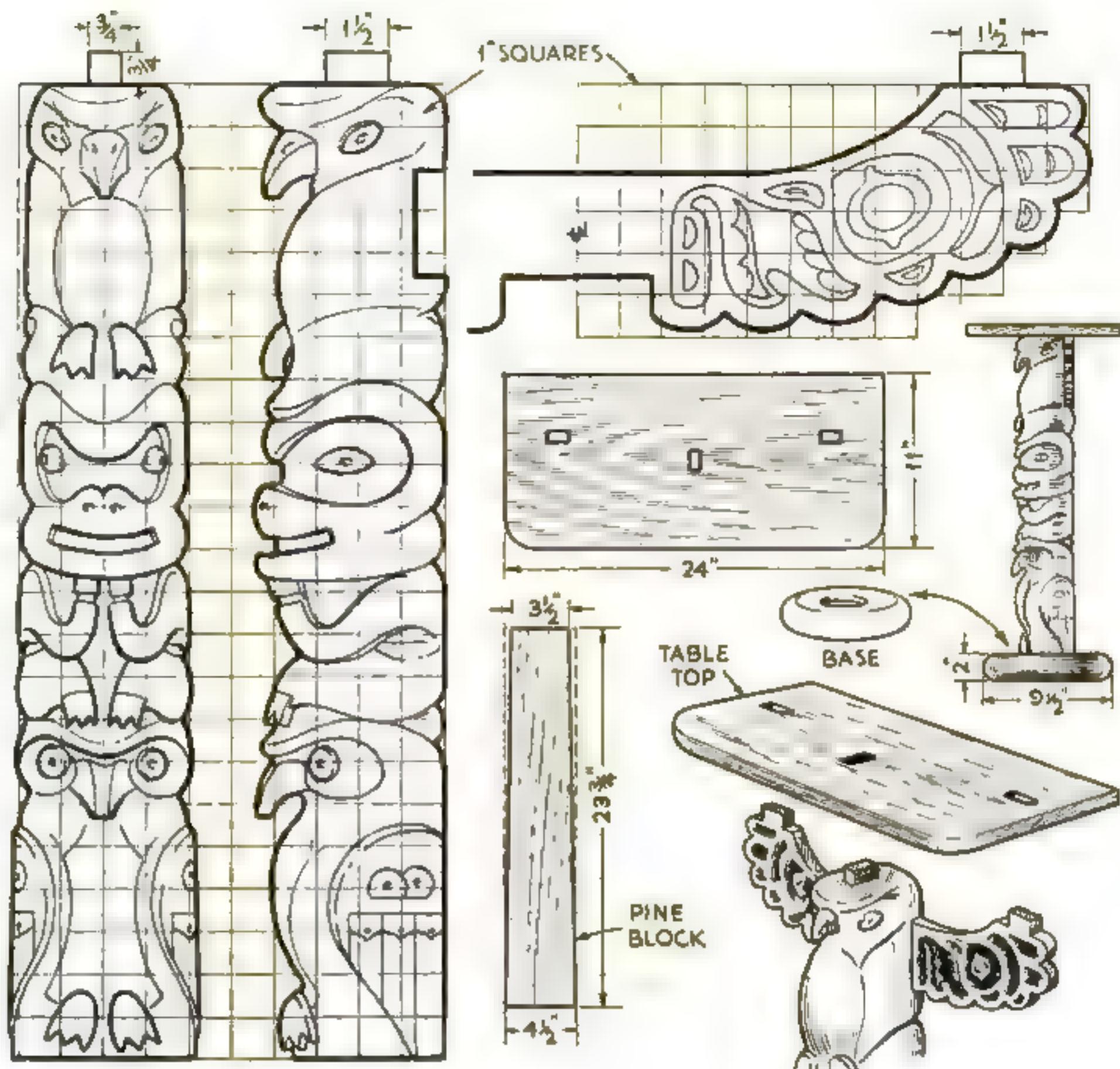
Four familiar projects dressed up



## Totem Pole Forms Support for a Novel End Table

SUPPORTED by a colorful miniature totem pole, this end table is an unusual project for the amateur wood carver. The pole and base are made of white pine, and the table top and wings from five-ply veneer.

Before carving the pole, plane the block to a taper as shown, from wood about 5 by 5 by 24 in. Use a sharp knife and chisel to shape the figures and other indentations. There are no carvings on the back. Cut or turn a 9½-in. disk 2 in.



How the totem pole is carved, the wings laid out, the top made, and the whole table assembled

thick for the base and make a recess for the totem pole to rest in. Use three countersunk screws to hold them together. Saw the wings from one piece of five-ply veneer  $\frac{3}{8}$  by 5½ by 24 in. and drill three holes in the center for screws to fasten it to the pole.

Give the totem pole and wings two coats of light tan oil paint; then color

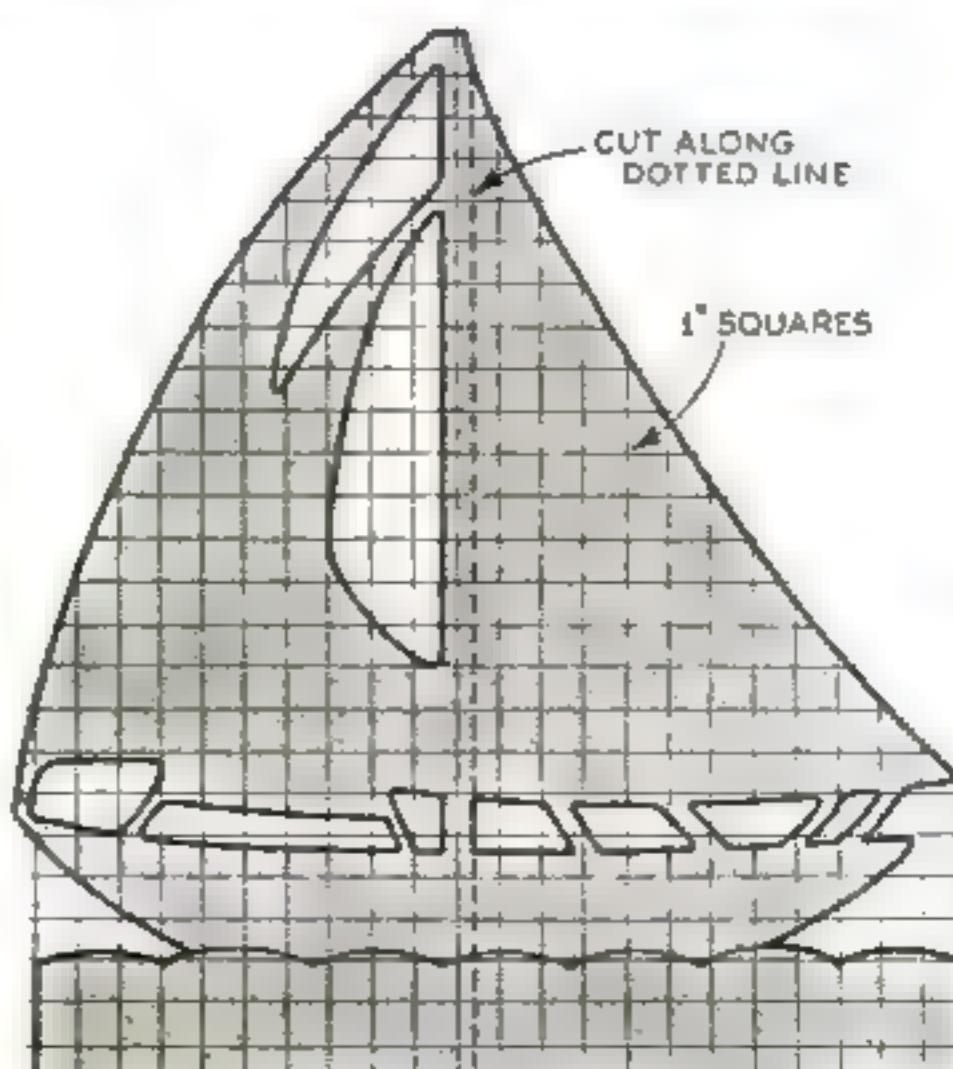
the figures in bright red, blue, and green, outlining the features in black. Tan forms the background for the wings, which have equally bright designs.

While this is drying, prepare the table top, making certain that holes are cut correctly for the three tenons. Sand the top down and finish with paint or stain, as preferred.—GRAY WOLF.

## Sailboat-shaped Whatnots or Corner Shelves

ONLY a jig saw is needed to make sailboat whatnots or small corner shelves. Two slightly different designs are shown. Make a full-size drawing and transfer it to  $\frac{1}{4}$ -in. thick plywood, or paste the paper on the wood. Cut out the openings where indicated, then saw around the outline. Finally cut the piece into two halves. The halves are placed at right angles to one another and glued and nailed or screwed together. From the same thickness of plywood, cut the three shelves. The radius can be obtained by measuring along the sides where it is intended to mount each shelf and subtracting about  $\frac{1}{2}$  in.

After being sanded, the completed whatnot can be finished by staining, filling, and waxing or varnishing, or it can be painted with enamel. If enamel is preferred, color the waves light green, the hull blue, and the sails white. Paint or stain the mast and the "ropes" between the sail and hull brown or black.—C. H.

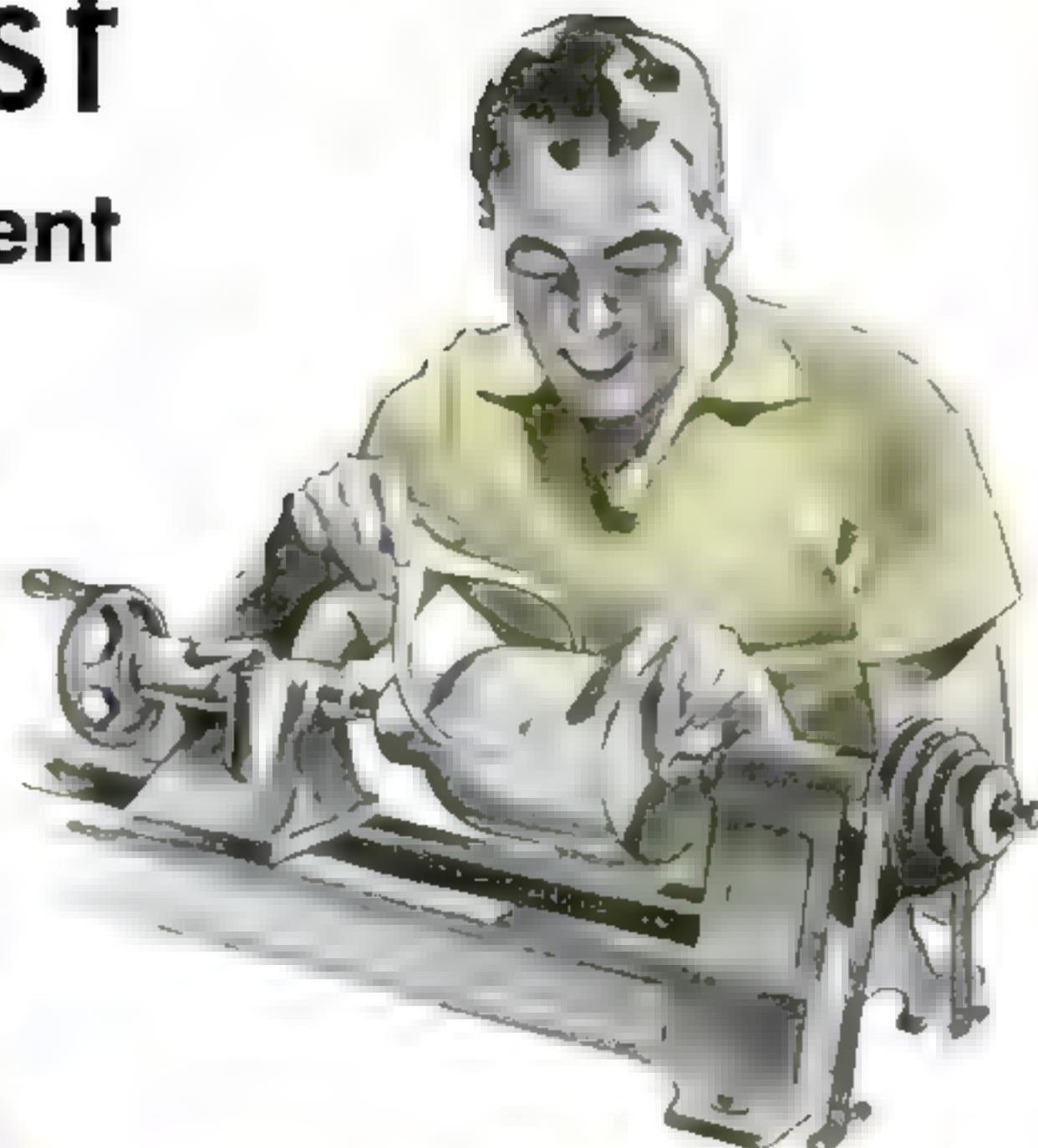
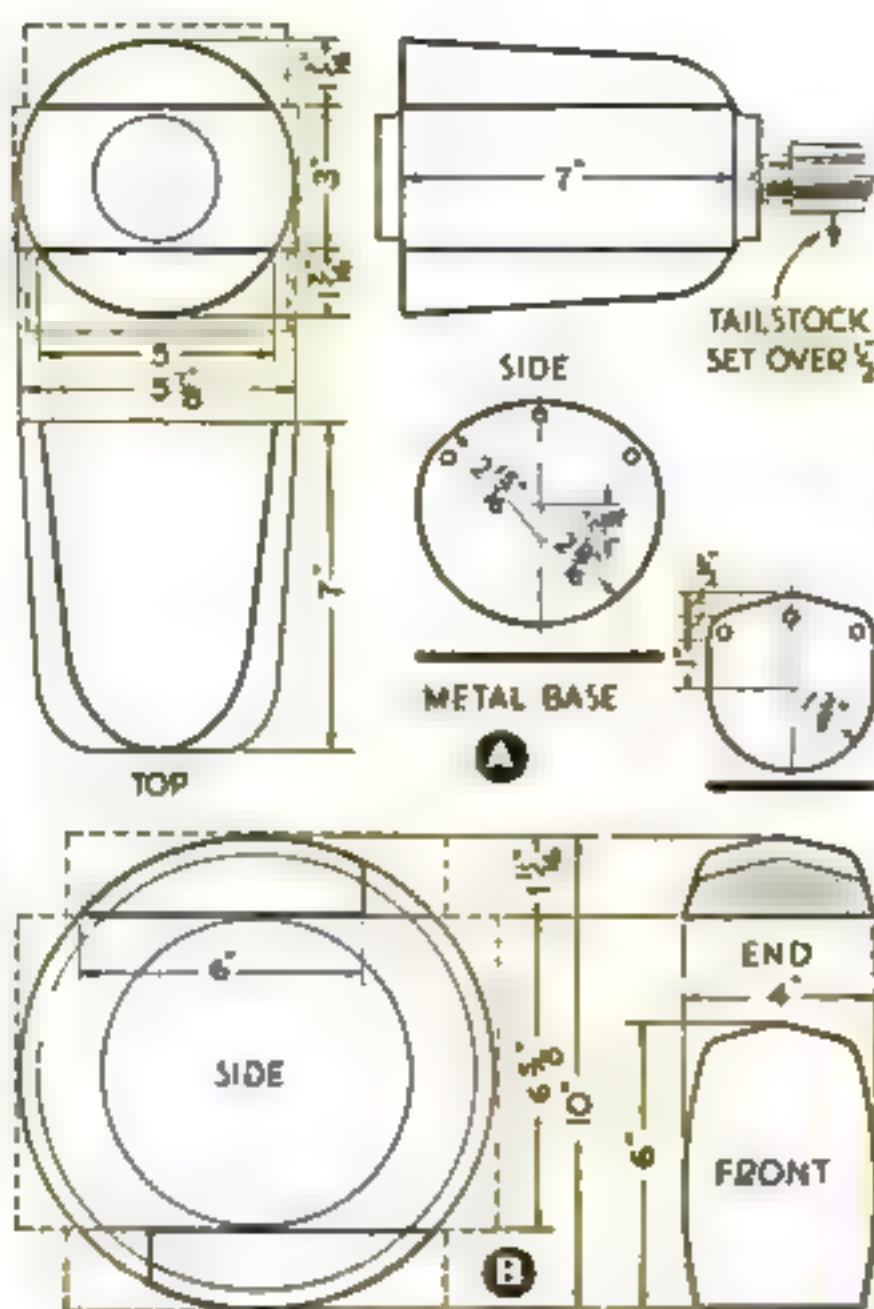


# with a New Twist

## by out-of-the-ordinary treatment



This book end and its partner were turned in one operation by the second of the two methods shown in the drawings at right.



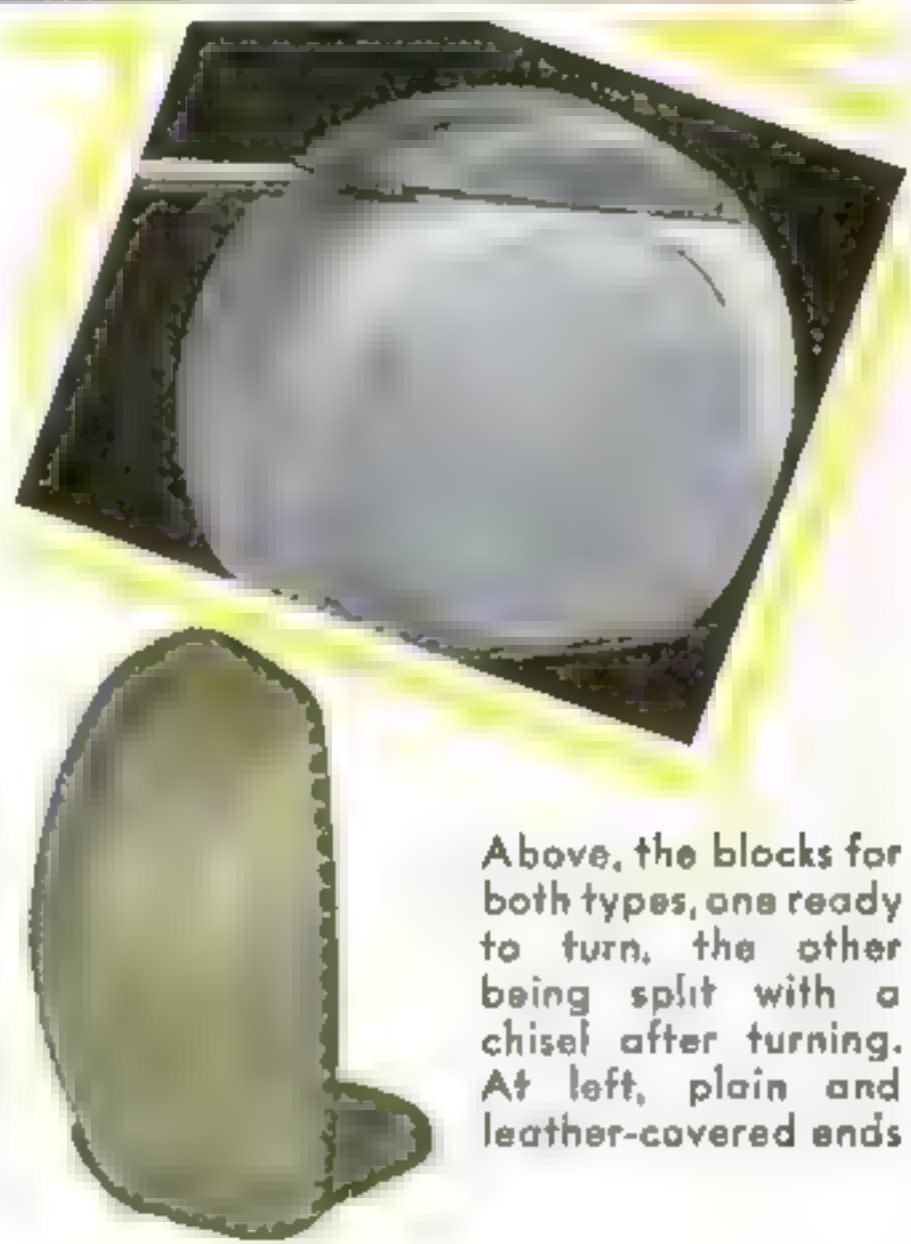
### Striking Wooden Book Ends Turned on Lathe, a Pair at a Time

WHETHER left in the natural wood, carved, or covered with tooled leather, the turned book ends illustrated are of distinctive appearance and make excellent gifts.

For the first style shown in the drawings, glue two blocks of the desired wood  $1\frac{1}{8}$  by  $5\frac{1}{4}$  by  $7\frac{1}{2}$  in. to the faces of a block of soft-wood 3 by 6 by 8 in. When dry, carefully center the stock in the lathe and turn. Check to see that the base is at right angles to the center of turning. To obtain the taper, offset the dead center  $\frac{1}{2}$  in. and turn as though cylindrical. Sand smooth and

finish as desired. Split the ends from the center block and mount on metal bases.

The second style requires two blocks  $1\frac{1}{4}$  by 4 by 8 in., glued to a center block 4 by  $6\frac{1}{8}$  by 10 in. Center this on a faceplate, and turn, sand, and finish. Make a saw (*Continued on page 129*)



Above, the blocks for both types, one ready to turn, the other being split with a chisel after turning. At left, plain and leather-covered ends

### Moon-and-Owl Candle Sconce Made of Three Metals

IN THE unique moon-and-owl candle sconce shown at the left, copper, brass, and steel are decoratively combined.

The moon is cut from 18-gauge yellow sheet brass, and is hammered on the front with a planishing hammer. The bracket is of 18-gauge soft sheet copper, similarly hammered. The saucer is of 22-gauge soft sheet copper, cupped to a depth of  $\frac{3}{8}$  in. The sharp corner that runs around the bottom is formed with a riveting hammer.

The candle cup is of  $\frac{1}{2}$ -in. inside diameter cop-

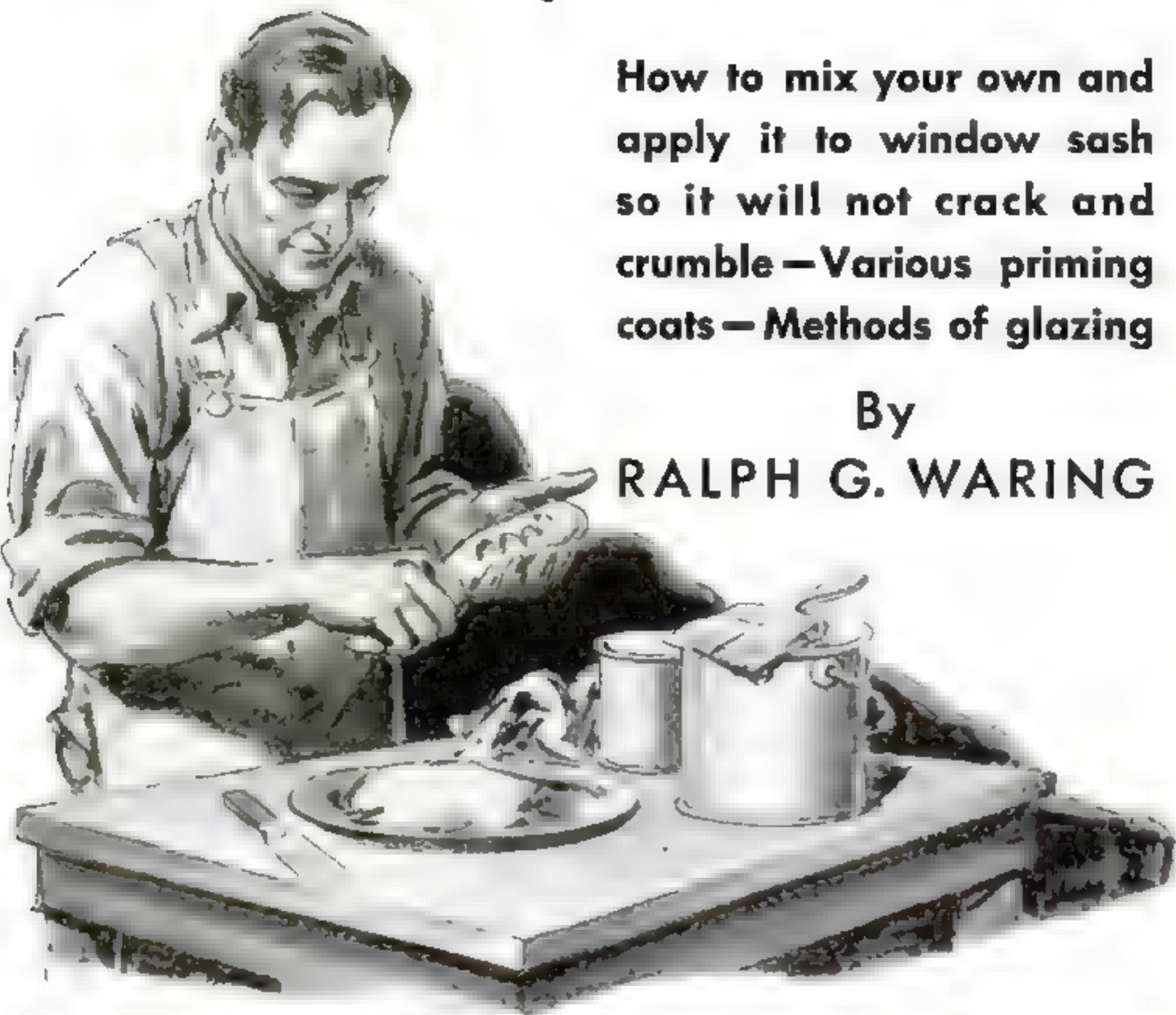
per tubing with a wall of about 18 gauge. Place the tubing over the end of a  $\frac{3}{4}$ -in. round iron bar, and, holding one end up slightly, hammer around the end to flare the metal. File off the edges of both ends.

The owl is cut from 18-gauge soft sheet steel and is hammered on the front. The lines are cut in with a blunt cold chisel, and the feathers on the breast are marked with an ordinary hollow-end nail set held at an angle so that only one side makes an impression. (*Continued on page 117*)

# PUTTY, the Heat Saver

**How to mix your own and apply it to window sash so it will not crack and crumble—Various priming coats—Methods of glazing**

By  
**RALPH G. WARING**



Pressing the putty in with a heavy glazing knife. The illustration at top shows how white-lead-and-whiting putty is prepared

Right, smoothing the putty bevel. The excess on the glass is caught on a small ball of putty and removed with a down sweep

**H**EAT and power engineers are very careful to test the masonry of boiler installations for hair-line checks or apparent pinholes, which may admit enough cold air to cut down a pound or two of steam and waste coal, money, and heat. This makes me wonder if the average home owner appreciates how much any poorly puttied sash in his house will affect the heating.

In the open country where constant winds prevail, it is especially important to service all windows. Whenever storm sash or weather stripping is required as an extra protection, the putty also must be given attention.

Ordinary putty, even when marked "pure lead putty," has not proved satis-

factory in our New York climate. The hot summers, burning noonday sun, and zero nights in winter place a terrific strain on paint and putty work. Very few persons have any conception of the strains and stresses that such extreme temperature changes exert on protective coatings for exteriors. In the case of putty, they cause premature crumbling.

Because of these conditions, I use homemade white-lead putty made from one third white-lead-in-oil paste and two thirds whiting. Worked up on a metal sheet with a glazing knife and then warmed by hand pressure, this produces a superior and durable putty. It should be blended with boiled linseed oil or a good grade of house paint into such a consistency that it does not stick to the hand, yet not too stiff to knife well. Under no circumstances should engine or machine oil be added because it would tend to destroy the binding properties of the linseed oil or house paint. Do not judge the condition of the putty until it has been well worked and warmed by the hand.

Next, see that all putty rabbets on the sash are either primed with boiled linseed oil and dried, or painted one coat and dried, or primed with one coat of freshly mixed aluminum and spar varnish and dried.

If considerable priming is to be done, use 2 lb. of aluminum bronze (varnish-mixing grade) in 1 gal. of outside spar varnish, or proportionate quantities. First, wet the aluminum powder with a very little turpentine to make a thick, well smoothed-out paste; then gradually add the measured amount of varnish required for the weight of bronze powder used. Stir well before brushing on the sash. Let dry hard before putting.

**T**HE aluminum type of priming is especially valuable since it not only seals the wood and prevents absorption of the oil from the putty, but offers a good bonding surface for the newly applied putty. A priming coat must not be omitted on either old or new sash if long-lasting work is desired.

Whenever possible and convenient, if much sash-putty work is to be done, the sash should be brought to a workbench where the frame can be held at a convenient angle for running the putty bevel.

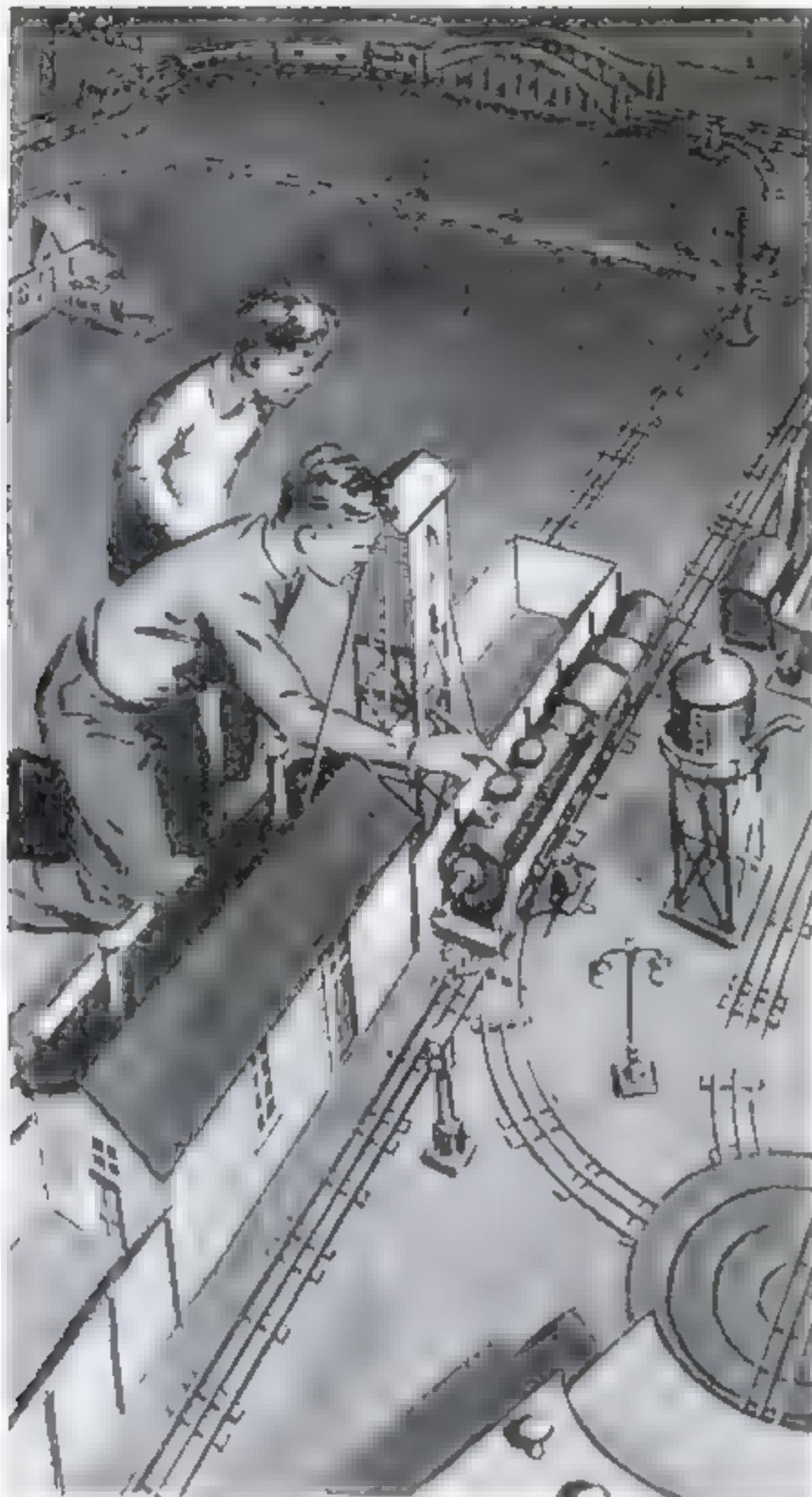
In the case of small repair portions, or on fixed sash sections in a greenhouse such as the one described last month (P.S.M., Jan. '38, p. 83), the work must be suited to the conditions at hand. On the greenhouse referred to, glazing was started between the rafters nearest the house while the mechanic stood on a plank scaffold with his body projecting up through the next open rafter space. The glass sheets were lapped half an inch, after starting with the lower plate, and held by square-cut sash-glazing pins or zinc triangles. All sash bars had been primed with aluminum paint before erection so that they were ready for (*Continued on page 115*)



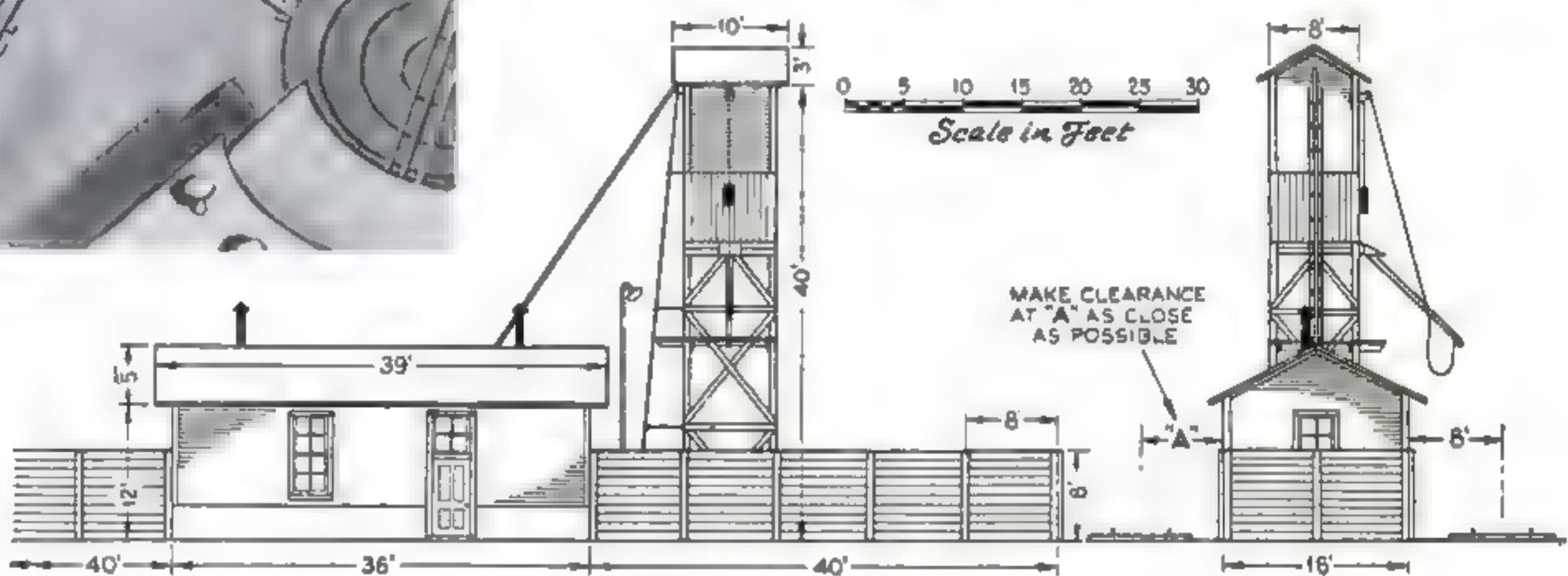
In filling cracks or blemishes on flat work, putty is forced in with the thumb, then cut off flush with a flexible putty knife

# Sand House

ADDS REALISM TO A  
Model Railway Layout



The sand house is set between the tracks with little clearance. By using the scale in feet, it can be built to suit any gauge railroad



## Wheels for Train Models Cast in Wood Molds

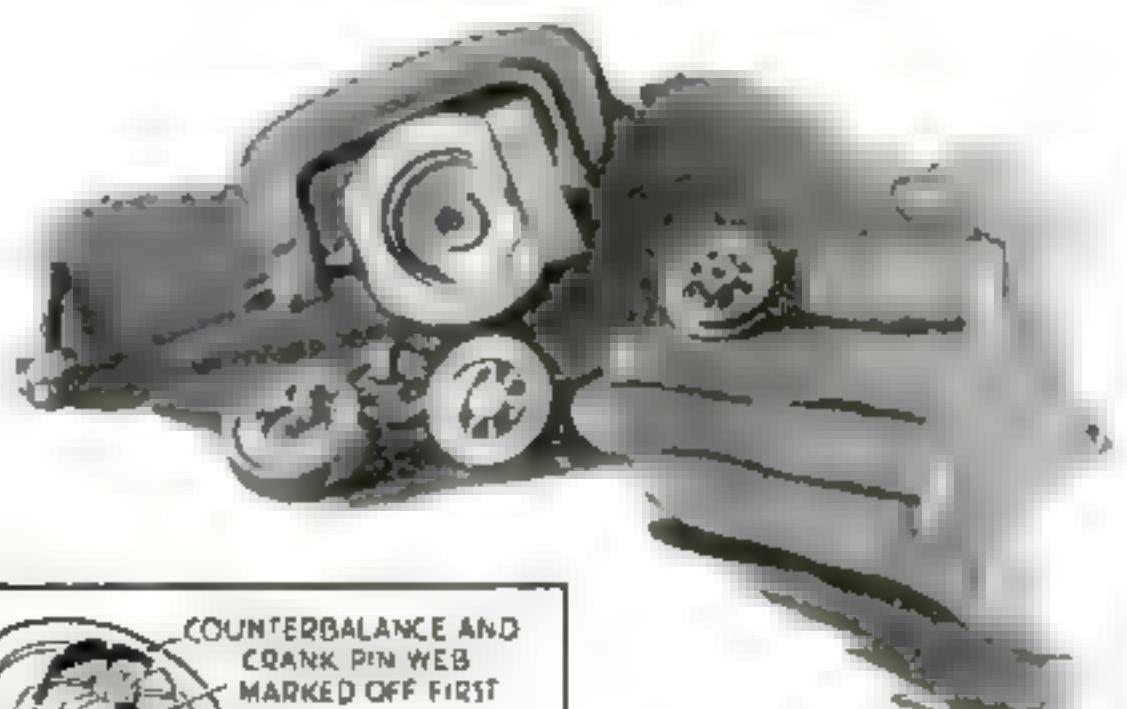
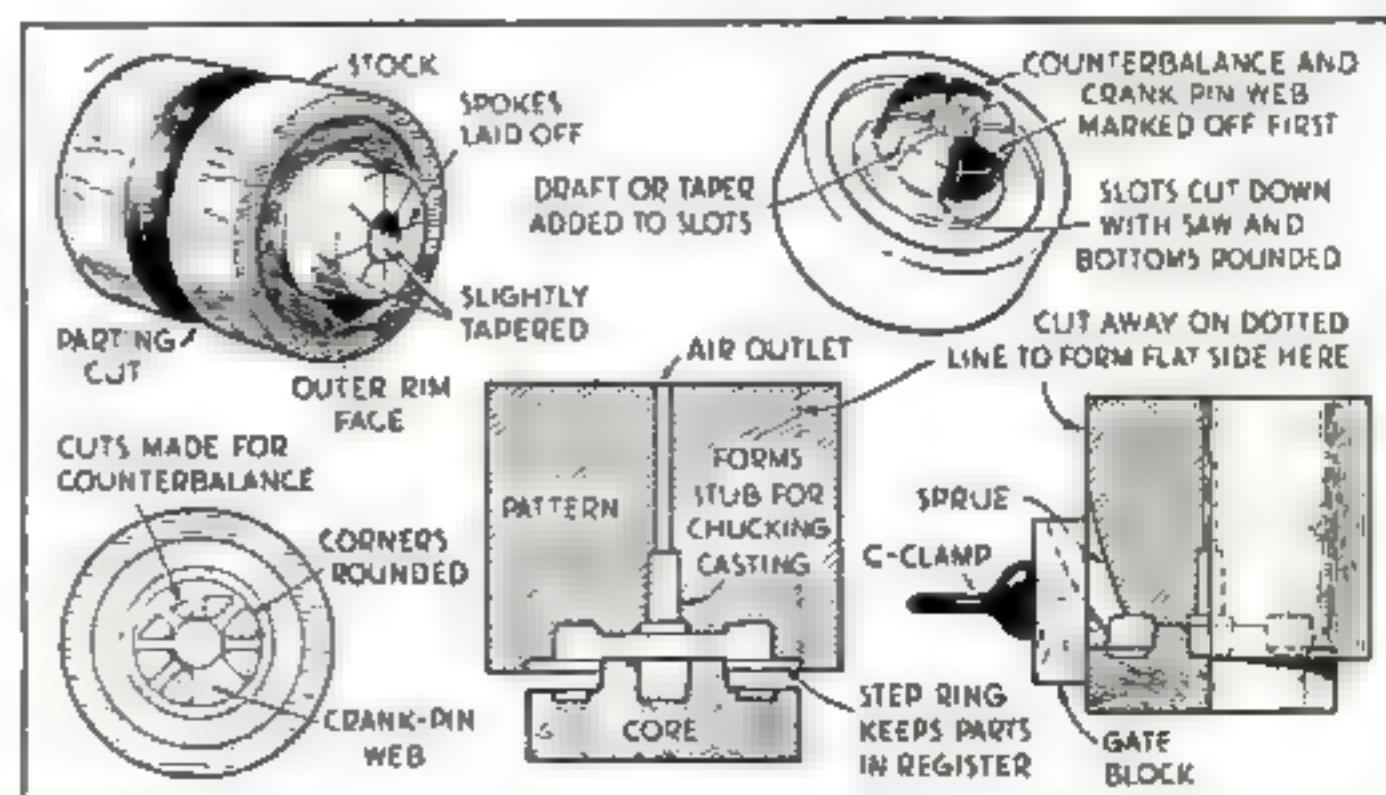
**E**XCELLENT drivers and truck wheels for model railway equipment may be cast from type metal by using molds turned from any fine-grained, well-seasoned hardwood.

In making the forms, the core is first turned up to the exact dimensions of the finished wheel. Rim faces, hub faces, flanges, and counterbalance are later machined, and to provide for this, are deepened or increased to add  $1/16$  in. of excess metal to the finished casting over these parts. Finally, the core is given a slight taper or draft, as shown in the drawings, before it is removed from the lathe.

The pattern block is 2 in. long and about  $\frac{1}{2}$  in. larger in diameter than the core. The hole that forms the chuck stub should be  $\frac{3}{4}$  in. long and at least  $\frac{1}{4}$  in. in diameter. The pattern is run in the thickness of the wheel, plus  $\frac{1}{8}$  in. for the step ring and the allowance for machining. The step ring is cut last of all, care being taken not to get it too deep and to see that it fits around

the core snugly to prevent leakage.

The gate block fits over a channel cut in the flattened side of the pattern block to form the sprue. It must be deep enough so the metal will fill the stub before overflowing.—R. S. MACNEILL.



Thirty castings can be made from one set of molds if the metal is not overheated. Warm the molds thoroughly before using, and have the metal sufficiently hot to brown a thin shaving or paper. If the casting sticks to core, check the taper of the spoke slots

**YOU CAN DISPLAY EITHER  
BOOKS OR CHINA IN THIS**

# Colonial

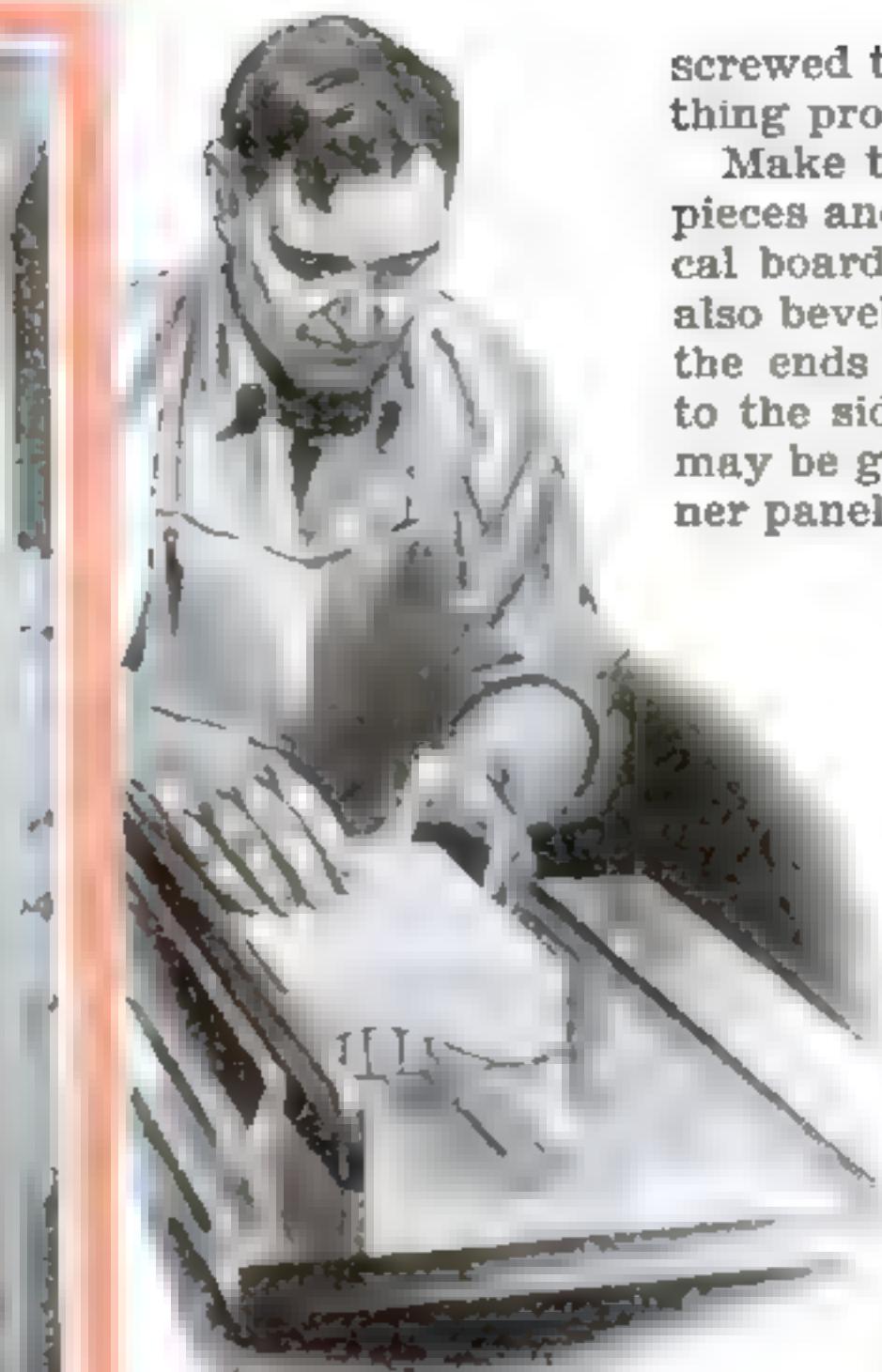


For the home library, this type of bookcase has many advantages. It gives fine display to well-bound volumes, has a cupboard for large books and for magazines, and there is a wide shelf for consulting books that are awkward to handle.



**B**OOKS, always very decorative, appear to their best advantage in a Colonial Welsh-dresser type of bookcase such as the one illustrated above. The ample cupboard space in the lower part of the cabinet is for magazines and large volumes, and a wide shelf is provided upon which to examine any heavy book. The piece will serve equally well, of course, as a dresser. Its use for that purpose is shown on the facing page.

First, glue up the sides to the dimensions given in the list of materials and rabbet them along the rear edge on the inside to receive the back. Next, glue up the table board and cut the board for the top and for the floor. Now cut the dadoes for the top. It is a good idea to fasten all of the cleats to the insides of the sides first; then the top and the table board may be nailed, and the floor



The stock for the feet is roughed out on a circular saw and finished with a large gouge. Right, the glued-up stock for one of the sides and for the table board. Below, an underneath view showing the feet



screwed to the sides. Be sure to square everything properly.

Make the back next. Get out the horizontal pieces and groove one edge. Prepare the vertical boards, cut rabbets along their edges, and also bevel them, as shown. Cut the tongues on the ends and assemble the back; then nail it to the sides. The back of the cupboard below may be glued up into one wide piece, or a thinner panel stock may even be used.

Four pieces are required for the frame to which the doors are to be fastened, and these are mortised and tenoned together, then nailed to the sides with sixpenny finish nails. The shelves in the cupboard are optional and may be placed in the cupboard at any time. Like the upper shelves,

## LIST OF MATERIALS

Sides, made from 2 pc.  $\frac{3}{8} \times 10\frac{1}{4} \times 70$  and 2 pc.  $\frac{3}{8} \times 10 \times 27$ .

Table board,  $\frac{3}{8} \times 22 \times 38$ .

Floor,  $\frac{3}{8} \times 19\frac{1}{4} \times 34\frac{1}{4}$ .

Shelves (bottom), 2 pc.  $\frac{3}{8} \times 19\frac{1}{4} \times 34\frac{1}{4}$ .

Top, 1 pc.  $\frac{3}{8} \times 10\frac{1}{4} \times 35$ .

Upper shelves, 2 pc.  $\frac{3}{8} \times 9\frac{1}{4} \times 34\frac{1}{4}$ .

Upper back, 1 pc.  $\frac{3}{8} \times 4\frac{1}{4} \times 35$  and 1 pc.  $\frac{3}{8} \times 4 \times 35$ ; also random-width boards to make a piece  $\frac{3}{8} \times 35 \times 32\frac{1}{4}$ .

Lower back, 1 pc.  $\frac{3}{8} \times 25 \times 35$ .

Scrolled rail, 1 pc.  $\frac{3}{8} \times 3 \times 36$ .

Scrolled stiles, 2 pc.  $\frac{3}{8} \times 3 \times 40$ .

Frame to which doors are fastened, 1 pc.  $\frac{3}{8} \times 1\frac{1}{2} \times 34\frac{1}{4}$ ; 1 pc.  $\frac{3}{8} \times 2\frac{1}{4} \times 34\frac{1}{4}$ ; 2 pc.  $\frac{3}{8} \times 2 \times 27$ .

Feet, all made from a piece  $2 \times 6 \times 60$ .

Door stiles, 4 pc.  $\frac{3}{8} \times 2\frac{1}{4} \times 23$ .

Door rails, 2 pc.  $\frac{3}{8} \times 3 \times 13\frac{1}{2}$  and 2 pc.  $\frac{3}{8} \times 2\frac{1}{4} \times 13\frac{1}{2}$ .

Door panels, 2 pc.  $\frac{3}{8} \times 11\frac{1}{2} \times 18$ .

X-rails, 4 pc.  $\frac{3}{8} \times 1\frac{1}{2} \times 20\frac{1}{2}$ .

Crown molding, made from 1 pc.  $\frac{3}{8} \times 4 \times 70$ .

**NOTE:** All dimensions are given in inches. For molding, corner blocks, cleats, and the like, refer to the drawing. The entire piece, excluding the feet, may be made from 90 board feet of lumber, in pieces  $\frac{3}{8}$  in. thick, 12 in. wide, and 10 ft. long. With proper cutting, there will be practically no waste.

# Welsh Dresser

By FRANKLIN H. GOTTSCHALL

they are supported on cleats screwed to the sides.

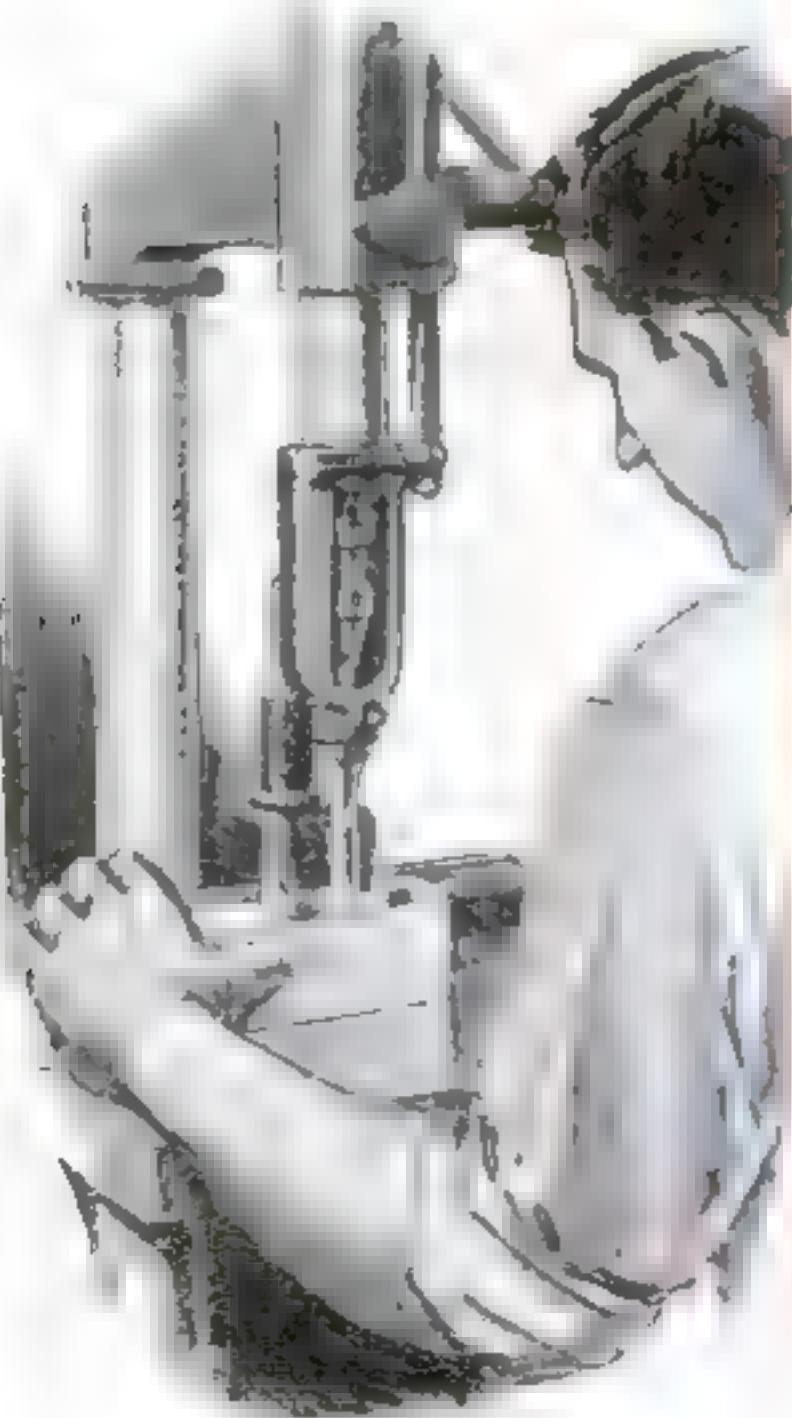
Cut out the scrolled pieces for the top section. These are joined together at the top with end-lap joints and nailed to the sides. Fill all nail holes with a plastic composition wood and sand smooth.

Make the feet from blocks of wood 2 in. thick. One of the illustrations shows the cuts made on the saw when starting to shape these. They are chiseled to shape with a large gouge, then mitered where they are joined at the front, and finally cut to shape on the band saw. Put glue on the miters and fasten the pieces together with corrugated fasteners as shown in the photograph of the bottom assembly. This illustration also makes clear how the back feet are fastened together and how the feet are attached to the cabinet.

The molding may be made on the shaper, or a similar molding may be purchased. The crown molding should be made by the same method shown for making the feet, and it must be cut by placing it in the miter box at a 30-60-deg. angle when cutting the miters.

Make the doors as in the construction detail. The X-strips and molding are bradded to the panel. The doors are fastened to the frame with wrought-iron butterfly hinges,

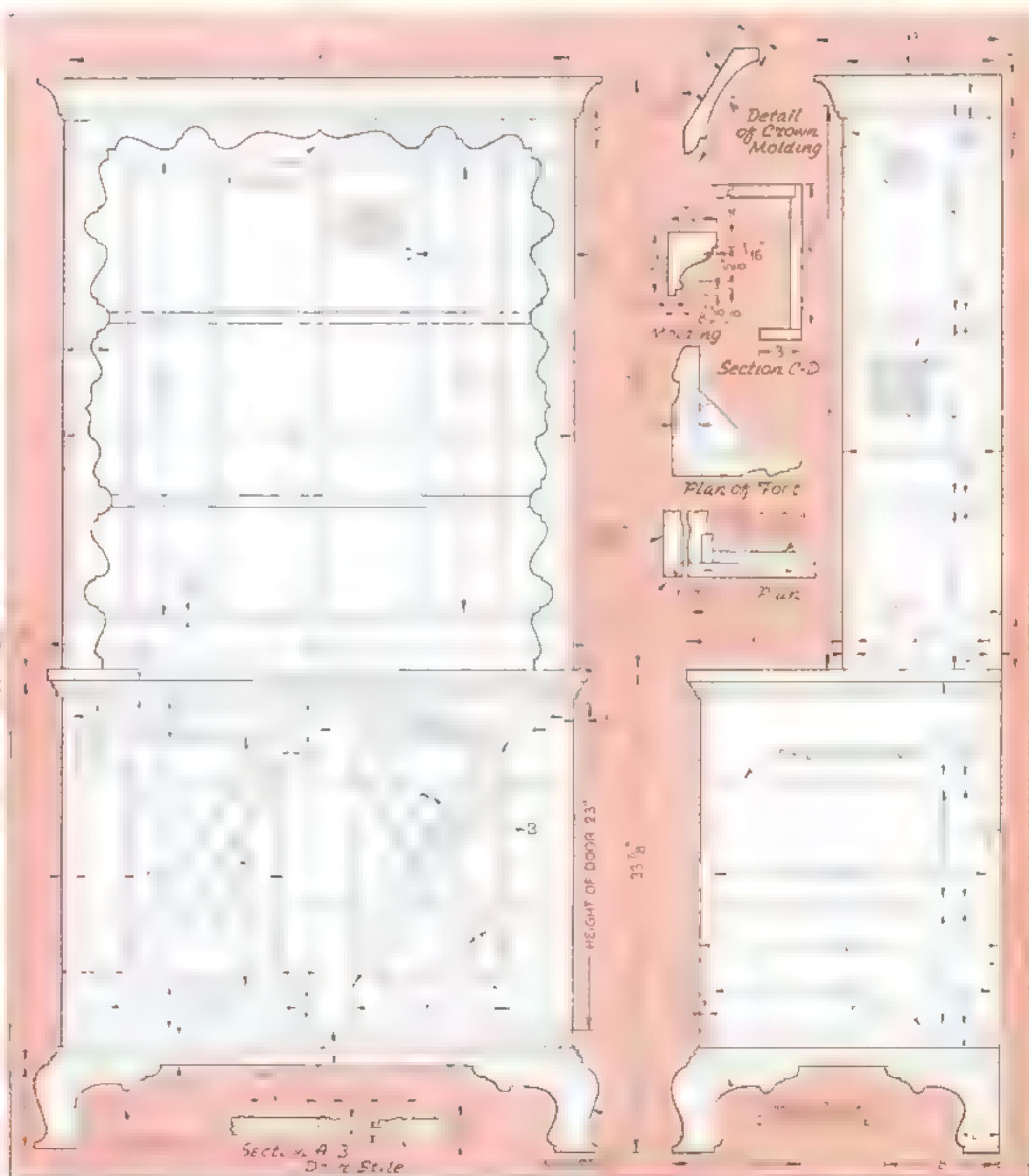
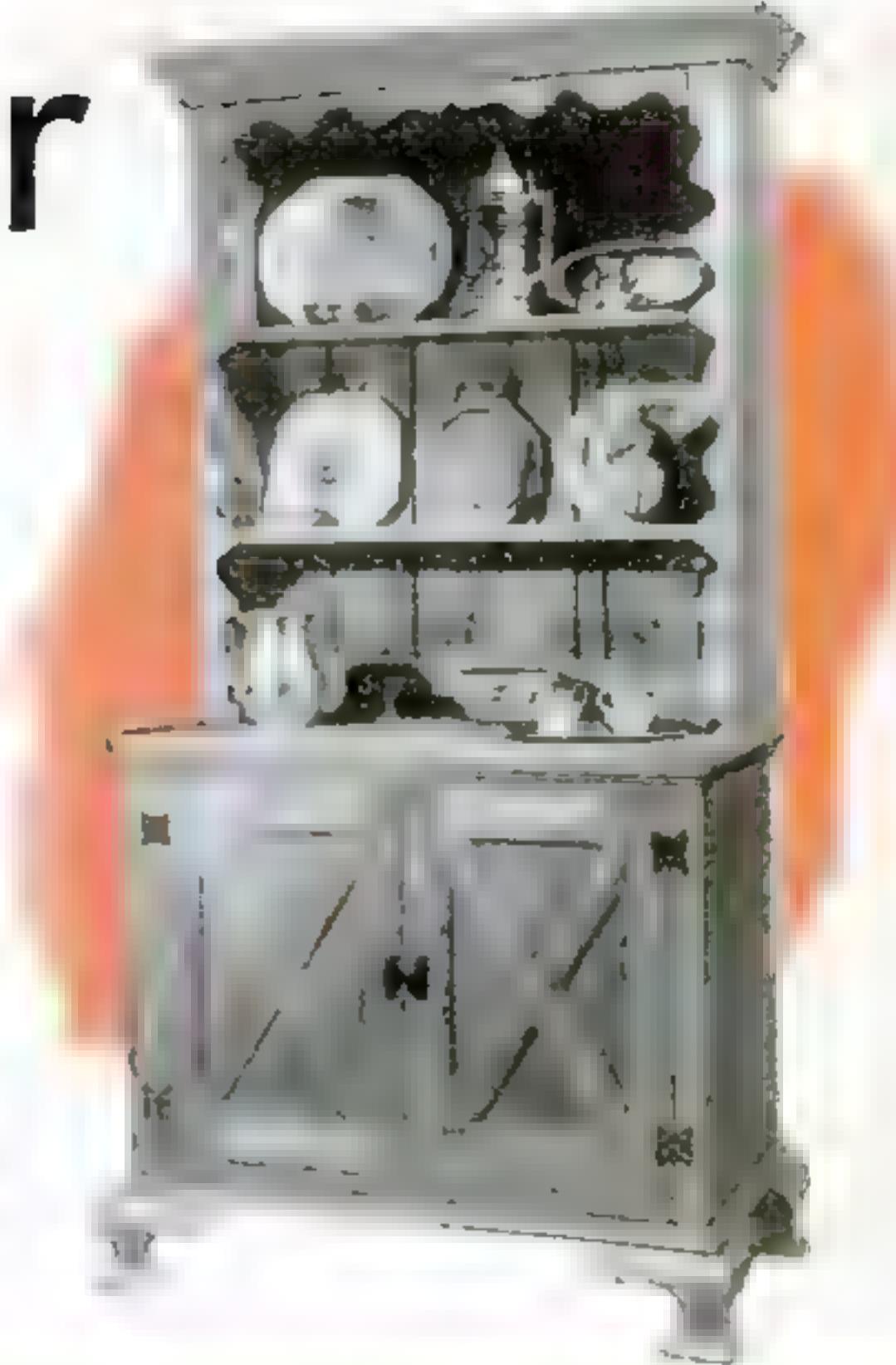
Mortising the door stiles. The diagonal strips and molding of the doors are bradded to the panels



and the door latch is also of this material, designed to match.

The back of the dresser comes down flush with the floor as indicated in the side view below. A rabbet is cut in the back of each of the rear legs. This is clearly shown in the photograph of the bottom on the opposite page.

In the bookcase illustrated, selected knotty white pine was used. A few solid knots in the wood lend character and charm to the piece, but too many make the wood difficult to work. A very light transparent stain should be used so as not to hide the beauty of the figure in the wood. Of course, the entire dresser must be thoroughly sanded before finishing.

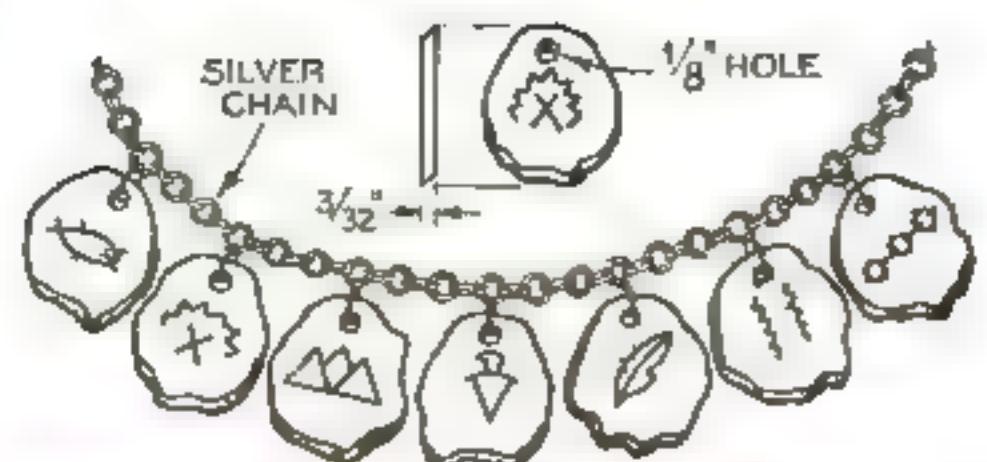


Front and side views of the assembled bookcase, and details of the moldings, feet, doors, and other parts. The three decorative scroll-sawed pieces are fastened at the corners with end-lap joints

# Indian Friendship Necklace



The necklace is an original, decorative piece of costume jewelry. At right, engraving symbols with a knife point



Chain with deerhorn charms, and some symbols from which to make a selection

SOME friend of yours might enjoy wearing an Indian friendship necklace similar to the one shown. It bears a charm for each of the seven days of the week, and each charm conveys a message of friendship.

The only materials necessary are a part of a deer antler and a large-link silver chain with seven jump links. The chain and jump links may be purchased through a jeweler, or a second-hand chain may be obtained in a pawn shop. An expert metal worker may even wish to make his own chain from silver wire.

The charms are sawed with a fine-tooth hack saw from the butt end of an antler. Only an inch or so will be needed to make the seven charms. Such a small part is removed from an antler that it will not destroy its value as an ornament or as a prized memento of a hunt.

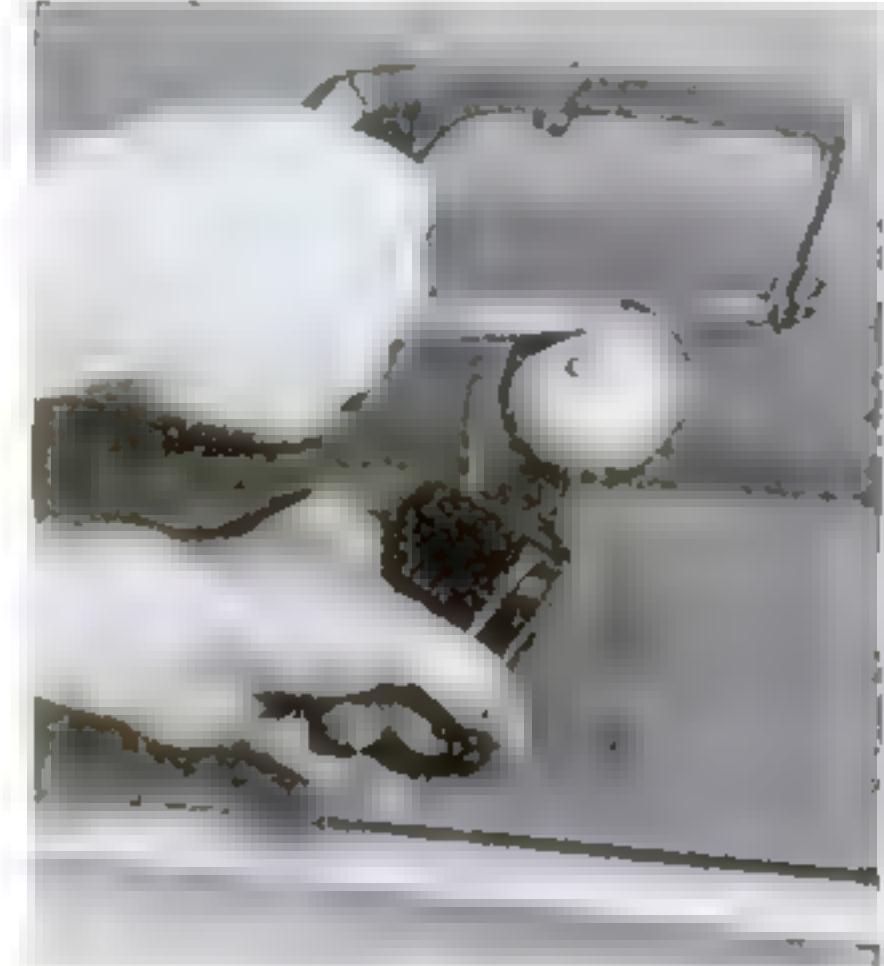
The antler is held in a vise for sawing. If the sections are cut on a slight diagonal, they will be more attractive. Remove the saw-tooth marks from the disks with files and fine sandpaper. For attaching the charms to the chain, drill  $\frac{1}{8}$ -in. holes.

The Indian picture writings or symbols are first placed on the charms with a lead pencil. They are then engraved with the pointed blade of a penknife or other sharp-pointed instrument. Finally, trace around the designs with a sharp-pointed pen and ink.—GEORGE A. SMITH.

## Camera Tripod Fitted with Snowshoes

FOR filming winter sport events, a tripod may be used successfully on snow by equipping it with small, slip-on snowshoes. They make it possible to use a telephoto lens without a trace of unsteadiness.

Two straps of good leather about  $\frac{1}{2}$  in. wide and 5 in. long are crossed and riveted or sewed to a steel ring about 3 in. in diameter, as shown. A hole somewhat smaller than the tripod point is punched in the middle where the straps intersect. From this hole is cut a small slit about  $\frac{1}{4}$  in. long to allow the point of the tripod to be slipped through with ease.—MARTIN G. WINTERTON.



## Slot in Gong Changes Tone of Doorbell

IF MORE than one doorbell is used in a house or apartment, it is desirable to have bells of different tones to enable one to distinguish readily the difference between the front and the rear door. If two bells of dissimilar type are not available, or if you happen to have two bells on hand of the same tone, one of them can be placed in the vise or over the edge of the bench and a cut made in the gong with a hack saw. This will lower the tone: the longer the cut, the lower the tone. You can determine the exact length of the cut by experimenting.

## Spring Clothespin Holds Milk Ticket on Bottle



WHERE milk tickets of cardboard are used and whenever it is necessary to leave a note, a convenient holder can be devised from a discarded spring clothespin and a leather thong as illustrated. This eliminates the trouble of removing a ticket from a wet bottle and the danger that a note may blow away.—JAMES MCQUEENY.



## Cat Climbs a Lattice to Get Her Food

A HANDY way to feed a cat is to put a window box outside a kitchen window and nail a lattice to the wall so that the cat can climb up without marring the wall or getting it muddy. All that is necessary is to raise the window or unhook the screen and set the food in the box. The cat will quickly learn to be there at the right time. This saves a lot of steps.—CLEMENT W. RICKMAN.



Trimming cheesecloth with a razor blade and straightedge. Do not let any seams come exactly along the corners

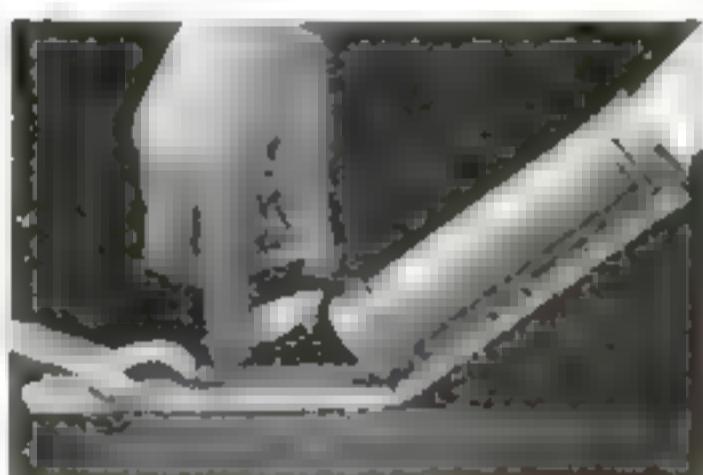
## Waterproof Cover Keeps Cellar Entrance Dry

OUTSIDE cellar entrances of the type illustrated may be rendered weather-tight, even in violent rainstorms, by providing a cover of waterproof cloth. Hem one end and insert a length of galvanized pipe. The weight of the pipe keeps the cover tight and prevents the wind from blowing it off. The upper end of the cover is fastened down permanently with a wooden strip.

The same idea is useful in camping and other outdoor work. A portable cover is made with two lengths of pipe, one at each end. This can be thrown over supplies, food, or any equipment that must be kept dry, and no time need be lost lashing it down. When not in use, the



cover is rolled smoothly on one of the pipes and stored away in any convenient place.—B. B.



## Rule Props up a Flash Light

IN EMERGENCY repair jobs at night, a pocket flash light is often the only available illumination. When the light must be thrown upwards at an angle, as is often the case, it can be propped up on a two-foot rule as shown, a wrench or other light weight being used to hold down the rule-joint end. The hinges must be quite stiff.—F. B.

## Celluloid and Cheesecloth Form Durable Finish

SMALL articles, such as boxes and carrying cases, that are subjected to considerable wear, can easily be given a very durable finish resembling artificial leather.

Place small scraps of celluloid such as old celluloid combs and toothbrush handles in a jar or can, pour a little lacquer reducer or thinner over them, cover and allow to stand overnight. Stir well and add more reducer until the mixture is uniform and has the consistency of heavy lacquer.

After sandpapering the article to be finished, quickly brush a heavy, even coating of the celluloid solution on one surface. While this coat is wet, apply a piece of cheesecloth, pressing it down smoothly. Cover all sur-

faces in this manner, making the seams by laying the two edges together.

Allow the piece to dry overnight. Sandpaper, dust off, and apply about three coats of lacquer enamel, allowing each coat to dry several hours before applying the next.

The finished surface will resist wear and does not chip even under repeated hammer blows.—ROLLIN H. WAMPLER.



When lacquered, the box will withstand extreme wear without cracks or marks



The celluloid solution is brushed on one surface at a time and then quickly covered with cheesecloth



# Better SHOP Methods

## They Slice Steel Like Cheese

**CUT-OFF ABRASIVE WHEELS...Their uses in the machine shop and for various building operations**

By HECTOR J. CHAMBERLAND

IT WAS no strange occurrence only a few years ago to see a machinist or toolmaker standing by the power hack saw waiting for a piece to drop off the bar, but not today in the busy shop. If the material is within reasonable size, the operator resorts to the cut-off wheel, which is very speedy.

Why such cutting performance with abrasive wheels? The answer is very simple: the cut-off wheel has thousands of sharp points, and every one actually cuts. Plumbers, sheet-metalworkers, steam fitters, roofers, side-wall applicators, tile and artificial stone cutters, carpenters, and numerous other craftsmen have found this new method of cutting economical, convenient, and precise.

Cut-off wheels are intended to be operated at a much higher speed than regular grinding wheels. This is made possible by three general types of bond—shellac, rubber, and synthetic resin or resinoid.

The abrasives are, of course, aluminum oxide and silicon carbide. The wheels are made in various grains, grades, and structures. The term "structure" refers to the spacing of the grains.

Fig. 1 (at right). Cutting tubing in the plant of a manufacturer of refrigerators. The wheel, which is of 16-in. size, is used with a coolant

Fig. 2 (below). Removing the end of a chipped drill point preparatory to resharpening

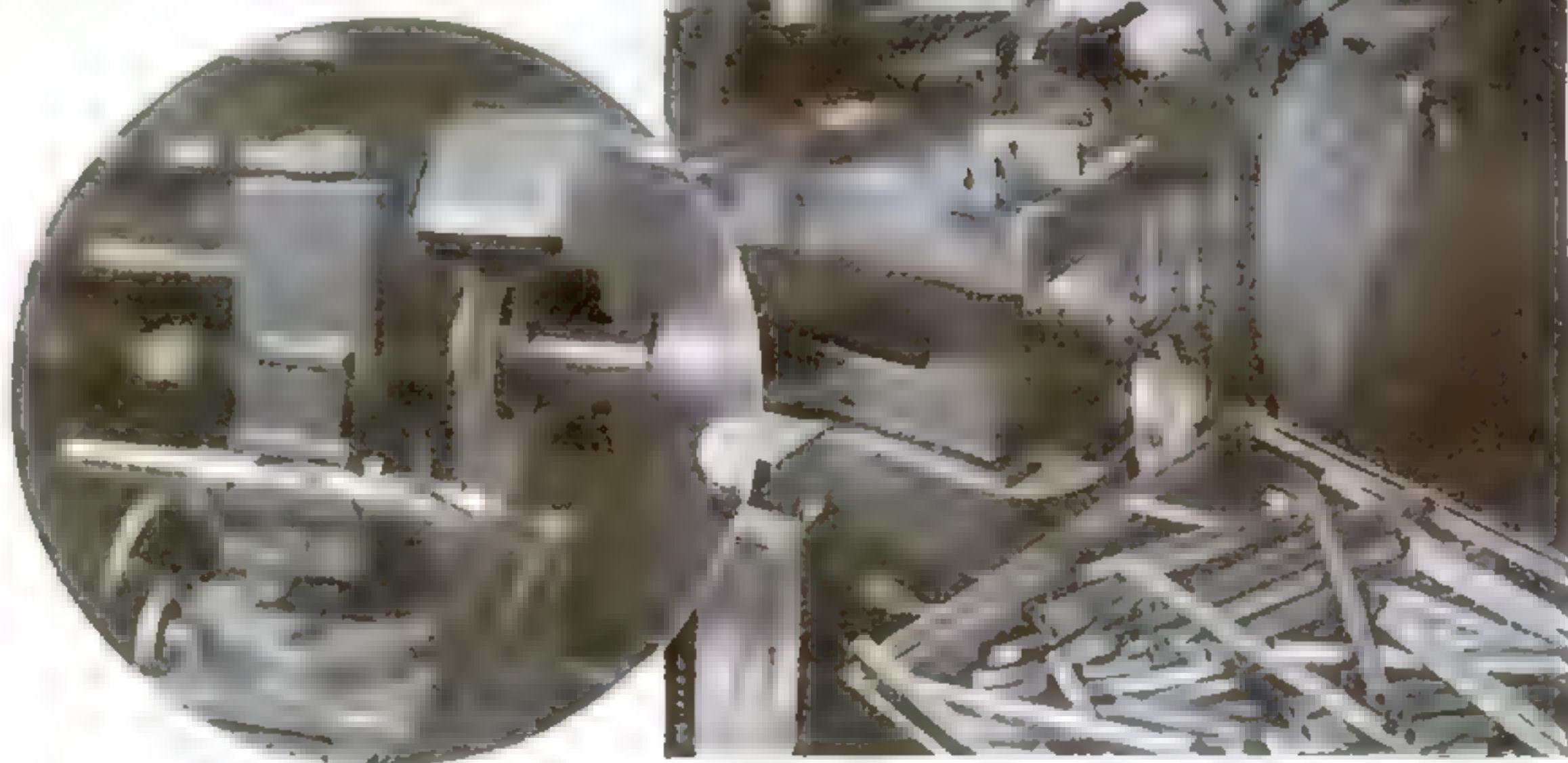


Fig. 3. A high-speed type of grinder cutting square bar stock

The introduction of synthetic resin as a bonding agent has made possible an increase in speed from 9,000 to 16,000 surface feet a minute, wheels 16 in. in diameter and  $\frac{1}{8}$ -in. face representing the practical maximum dimensions. Credit is due to rubber, however, for making cut-off wheels as thin as .005 in. These are used for slotting gold and iridium pen points. The shellac-bonded wheel is rather soft, and while it is still used for some toolroom work, it is given the preference for cutting steel for microscopic examination and the like.

The equipment used in connection with cut-off wheels is of three classifications: Specially designed machines of the high-speed types; the conventional pedestal and bench grinders, usually rebuilt for this purpose; and portable type grinders. In addition, many makeshift or revamped machines are extensively used. Except for the first classification, the equipment falls in the so-called low-speed group.

Up to the present, the maximum diameter that can be cut most economically is 2 in. for solid stock and 4 in. for tubing. This includes all kinds of steels and the toughest alloys. For plate stock, the width of cut depends on which is the cheapest—the cut-off wheel or flame cutting.

Figure 1 is a high-speed machine on a continual run of tubing. It uses a coolant and a wheel of 16-in. original diameter. When the wheel has worn to



Fig. 4. A portable unit is used with a special fixture on the job for cutting tile to be used in building construction

14 in., it has lost surface speed efficiency and is then used on low-speed equipment.

The cut-off grinder in Fig. 3 is also of the high-speed type. Providing a well-constructed spindle is available, its construction presents no problem to any machine shop. Such a machine can be made to use a wheel of 12-in. maximum diameter, operating at the previously mentioned 18,000 maximum s.f.p.m. When the wheel has worn to 10 in., it is suitable for toolroom cutting operations.

To this class of cut-off grinders can be added the submerged type shown in Fig. 5, where the cutting section of the wheel and the work are entirely under

water. The machine is used for cutting very thin-walled copper tubing and the like, plastics, and glass tubing or rod, where the least heat must be generated and chipping avoided.

In the latter case, a minimum amount of pressure and a speed of about 8,000 s.f.p.m. are recommended. The wheel-guard side plate in Fig 5 has been removed to permit a clear view.

In Fig. 7 is the first illustration of a low-speed cut-off machine. As a general rule no coolant is used. This machine is frequently built from scrap machine parts. A 1-h.p. electrical bench grinder, if available, will simplify matters and make the cost quite low. The material being cut in this case is 3½-in. boiler tubing. Imagine the time this piece of equipment can save a master plumber and steam fitter or a sheet-metal contractor. The maxi-

mum wheel diameter used for this kind of work is 12 in. at a maximum surface speed of 12,000 s.f.p.m.

Although space does not permit more than a passing mention of cut-off wheels in toolroom practice, it isn't fair to skip this end of it entirely for it was here where they were originally introduced. One of their first operations was cutting the end of a chipped drill point to resharpen it as in Fig 2. Their efficiency was soon recognized for cutting similar hardened items such as tool-bit stock, broken end mills, worn plug gages, and punches. Today, with improvised guards, wheels of 9 and 10 in. diameter and 3/32 or 1/8-in. face are regularly used for cutting off, recessing, grooving, salvaging, sharpening, and countless other operations. Wheels 8 by 1/16 in. are (*Continued on page 119*)



Fig. 5. Thin-walled copper tubing, plastics, and glass tubes or rods are often cut while submerged under water to avoid heating and chipping. Fig. 6 (in circle). Cutting molded plastic on saw-table type of machine



## Coil Spring Improves Clutch Handle

TO PREVENT the split type of clutch handle on screw machines from falling by its own weight into high or low speed and to keep the handle where one wants it, insert about two turns of a coil spring behind the clutch handle. The spring, if drawn up fairly tight and

held fast by the nut on the clutch handle, creates enough tension to hold the handle, yet allows it to operate easily. Suitable springs made from 3/16-in. wire and of a size to fit over the clutch shaft can be purchased at hardware or machinery stores.—O. R. S.



The clutch handles of a number of screw machines were prevented from falling by their own weight simply by adding a spring



## Acid Container Made from a Rubber Ball

ACID-PROOF and practically indestructible, one half of a good-sized soft rubber ball or of a bulb from a syringe or hydrometer makes a useful container for soldering liquids. A wood block with a hole bored in it will be needed to keep the half ball upright in most cases. The one illustrated, however, was cut from an old battery-filling syringe and, being flat on the bottom, requires no support. After the job is done, it is easy to return the fluid to the bottle merely by squeezing one side of the ball into a narrow lip.—W. C. W.

# FIRST STEPS WITH AN Oxyacetylene Cutting Torch

ALTHOUGH seldom covered in textbooks, it is the use of the oxyacetylene torch in cutting thin steel plates from  $1/16$  to  $\frac{1}{2}$  in. that is of most interest to the small-shop mechanic.

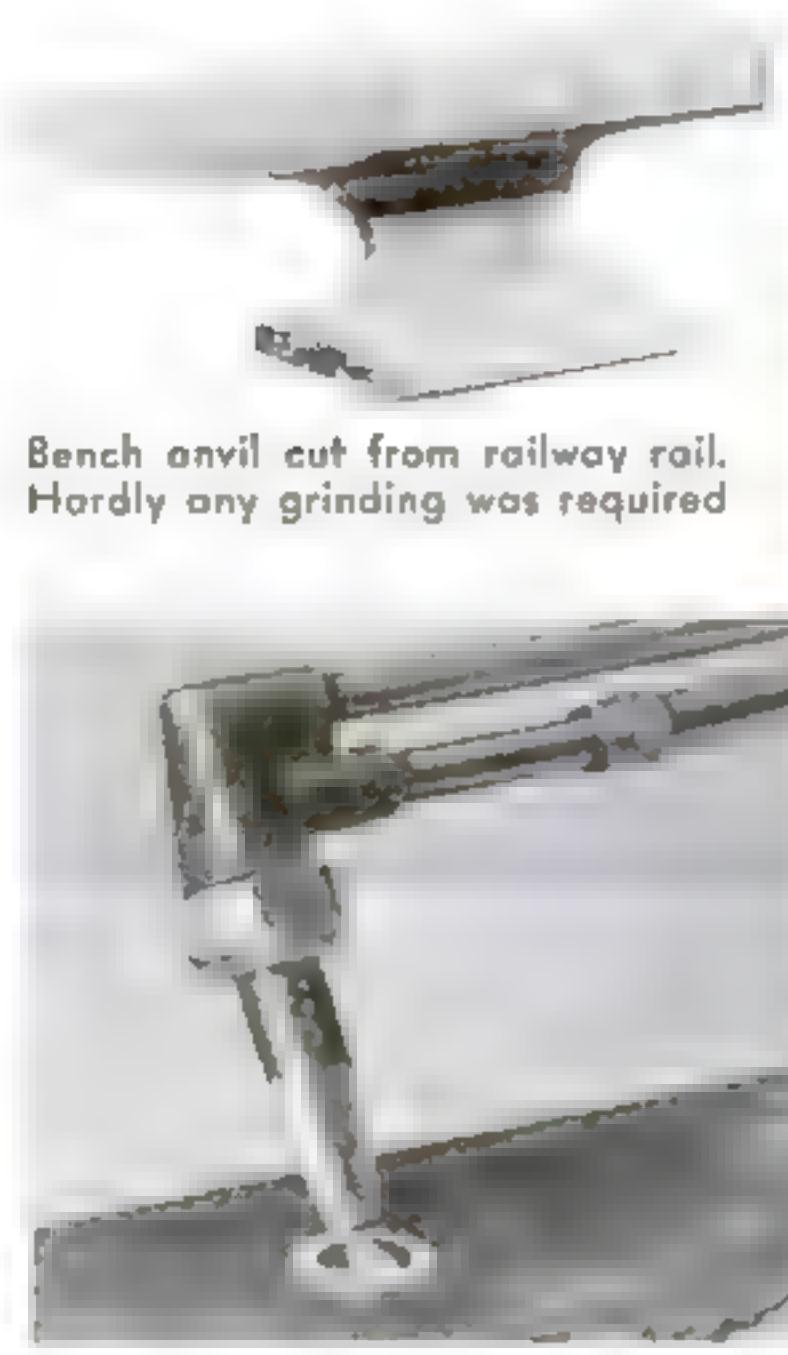
The operation is like this: A piece of steel or iron (cast iron excepted) is heated by the preheating jets of the torch to a temperature at which the iron will combine with oxygen and burn. A high-pressure jet of pure oxygen is then directed onto the heated metal and at once causes that part of the iron in contact with the oxygen to burn away. This is continued until a definite cut is made in the desired place. This applies to all rolled iron and steel and steel castings, but not cast iron or high-carbon or spring steel, which will be covered in one of several articles to follow on oxyacetylene work.

There are some points always stressed by the makers of oxyacetylene equipment, and these deserve even more consideration than they are given:

1. Never use on the oxygen line a hose that has ever been used for any other purpose whatsoever.

2. Never lower the working pressure on your regulator unless the service valve on your torch, supplied by that regulator, is open or the gas shut off and the hose drained.

3. Never use oil of any nature around any part of your welding equipment.



Bench anvil cut from railway rail.  
Hardly any grinding was required



The oxyacetylene torch needs care to insure the best results. Never stand directly in front or behind a regulator while you are turning it on

Correct position of the torch when starting to make a cut through a piece of steel plate

If you must lubricate some part, use pure high-grade white soap softened with water. It is safe.

4. Never stand directly in front or behind a regulator while turning it on.

5. If your torch back-fires, that is, burns back in the mixing chamber, shut the oxygen valve on the torch off first, and do it at once.

6. If the oxygen hose ignites and bursts, grab it between the break and

the regulator and make a sharp, tight kink in it; then shut off the tank valve and destroy every bit of the hose involved.

7. Whenever practicable while cutting or welding, have a bucket of water handy in which to cool the torch when it becomes overheated. This will add years to the life of your torches.

8. Be sure all connections are absolutely tight.—W. C. CHENEY.

## Cotter Puller Carried on Key Ring



IN REPAIR and inspection work, many small spring cotters are encountered which are so located as to be difficult to withdraw. I carry a small hook on my key ring for pulling them and find frequent use for it. The hook was originally the retaining hook of a common auto-radiator shield fastener, the wire of which is tough and strong enough to stand the strain of pulling.—F. B.

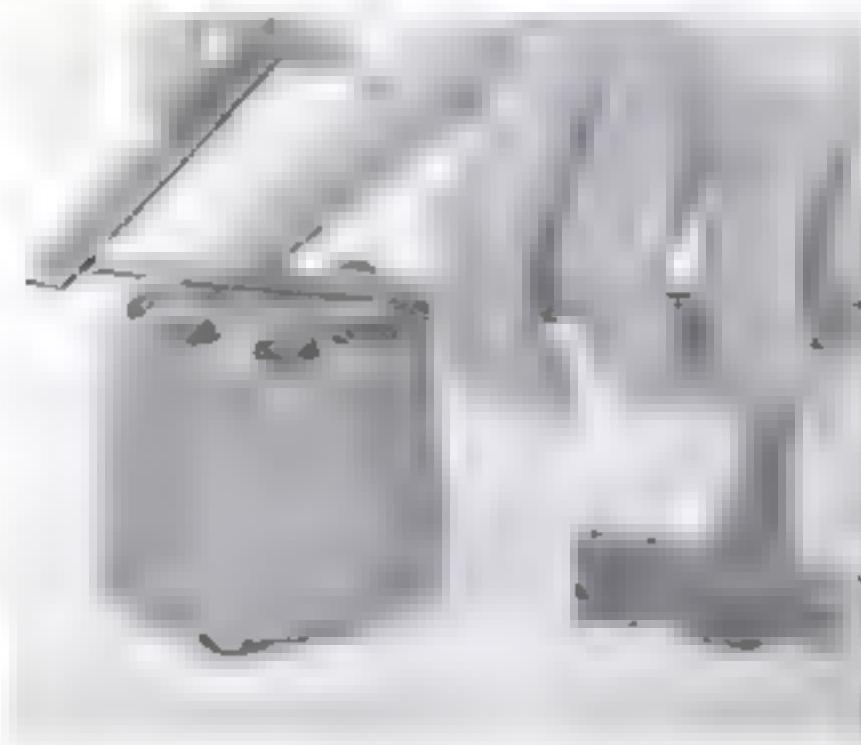


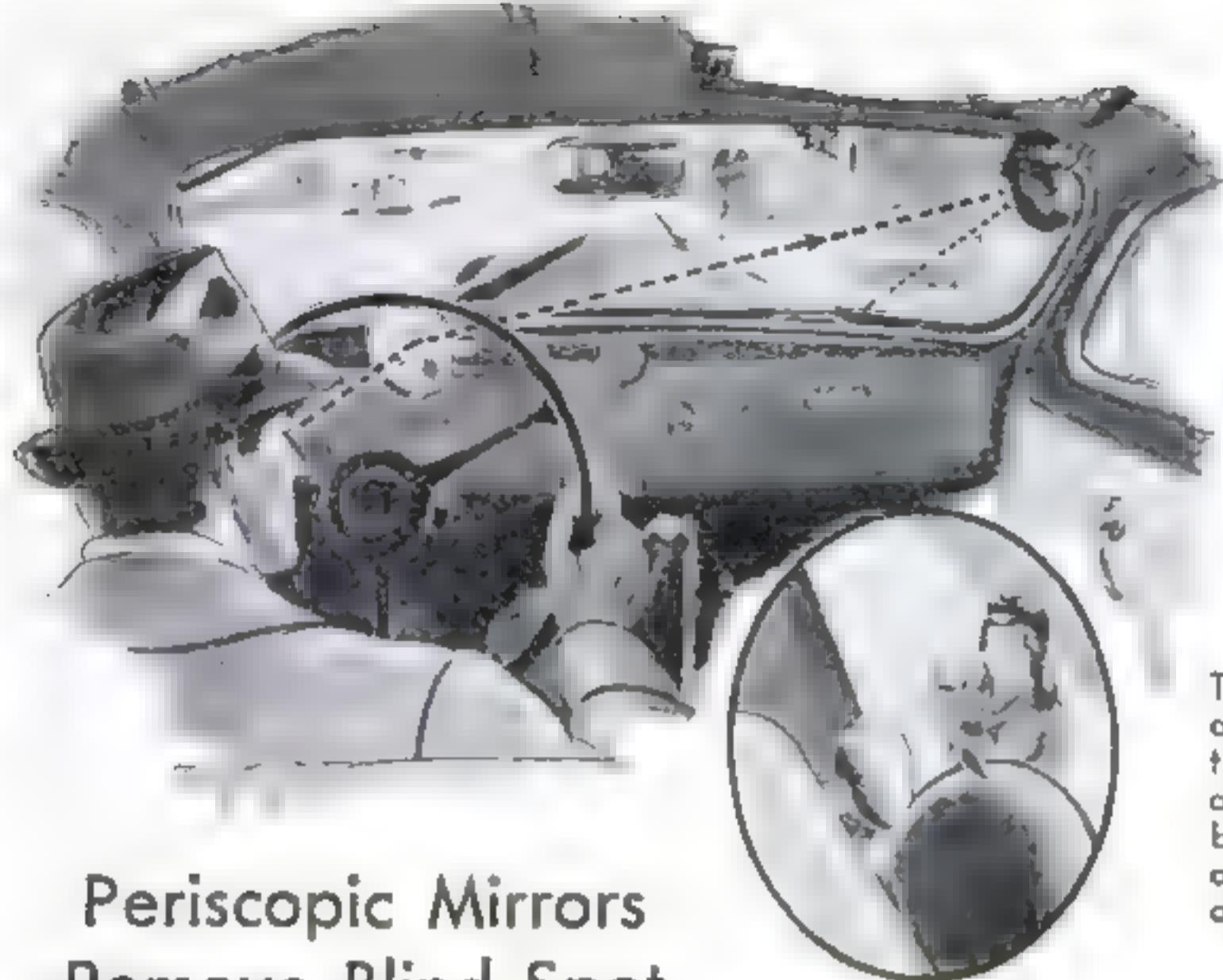
## Heat Gun Makes Taps and Reamers Cut Oversize

A CONVENIENT method of making a tap or a reamer cut slightly oversize is to heat the tool with the shop heat gun. The tap should be clamped in its holder or the reamer in its socket ready for use as soon as the heating is completed. The heating may be continued during the cutting operation if necessary. This is superior to the hot-water method of making the tool oversize, and the tool does not have to be dried afterwards.—W. C.

## Filing Block Studded with Rubber Tacks

FOR many odd, unhandy jobs of pointing and dressing small parts with the file, the device at the right is useful. A number of rubber-headed tacks are driven into both ends of a discarded wrapping-paper core roll or any similar piece of hardwood so that it is easy to hold small round objects of various diameters.





### Perisopic Mirrors Remove Blind Spot

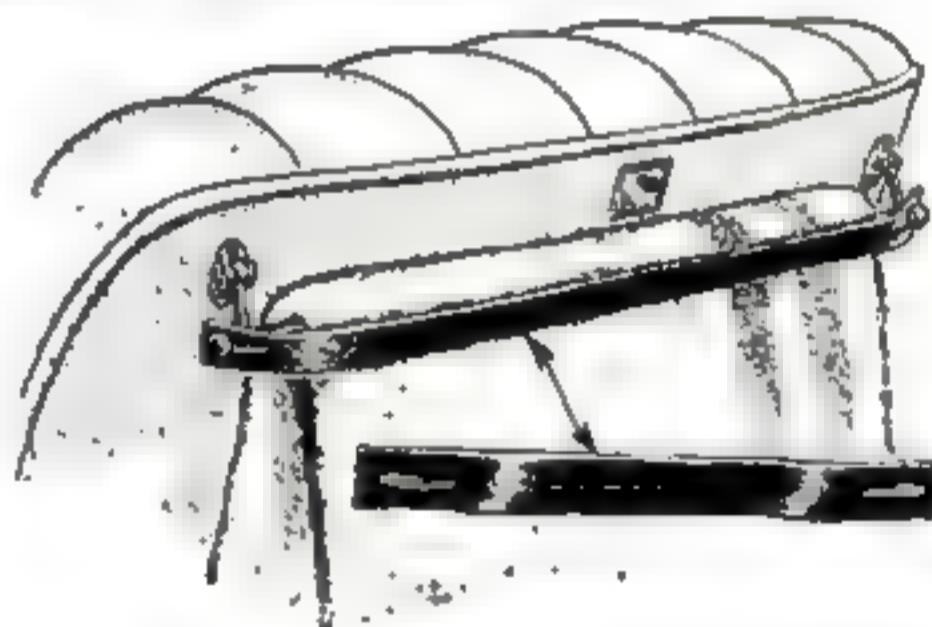
TWO ordinary rear-vision mirrors mounted on the dash and at the top of the windshield on my car serve to reduce the "blind spot" beyond the hood by many square feet. In effect a periscope, the mirrors show up objects that ordinarily cannot be seen from the

driver's seat. They enable me to see if children are playing in front of the car when I am about to start off. On the highway, they show exactly where the shoulder of the pavement begins, a valuable aid when driving on narrow roads.

—L. J. L.

### Rubber Strip Keeps Robe in Place

KEEPING the car robe from slipping off the hanger rail is accomplished easily by cutting a rubber strip from an old inner tube and providing a slit near each end. In use, the strip is simply looped over the hanger rail as indicated in the drawing reproduced at the right. This holds the robe or rug in place, and yet allows it to be both quickly and easily removed when it is needed.—A. H. W.

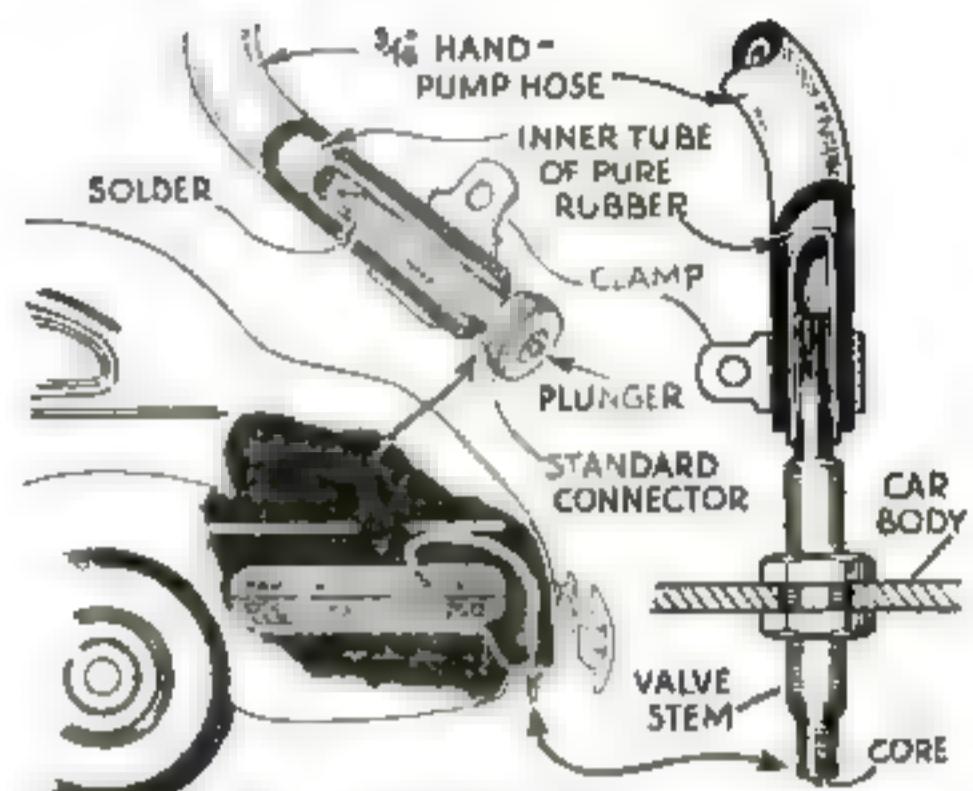


### Carpet Hung in Garage Sweeps Snow off Car

A PIECE of old carpet, the heavier the better, suspended from the top of the garage-door frame so that it just touches the roof of the car as it is driven in, is an excellent device for cleaning off snow that collects on the car roof during a snow storm.—A. H. W.

# Helpful Hints FOR Motorists

Two mirrors, mounted as at the left, show the driver the part of the road hidden by the car hood. The oval illustrates the area brought in view

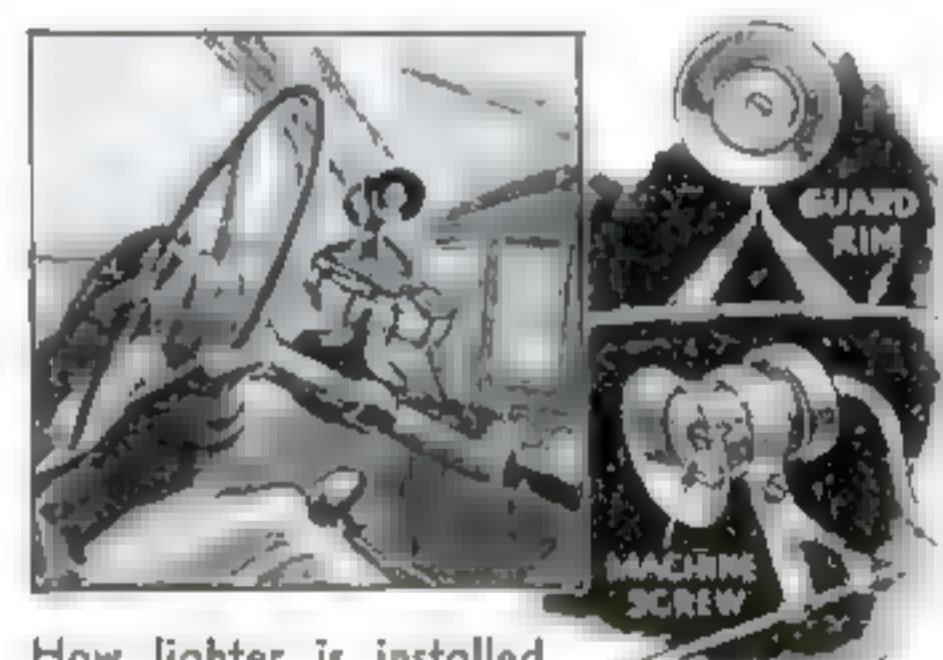


### Outside Valve for Spare Is Easily Installed

TO ELIMINATE the necessity of opening the luggage compartment on my car to check the spare-tire pressure, I installed the homemade device shown above, that has a handy valve extending from the rear of the car body. I lined an old tire-pump hose with pure-rubber tubing bought at a surgical-supply store, and connected one end to the tire, the other to the cut-down valve of an old tube, bolted through the body metal.—J. R. G.

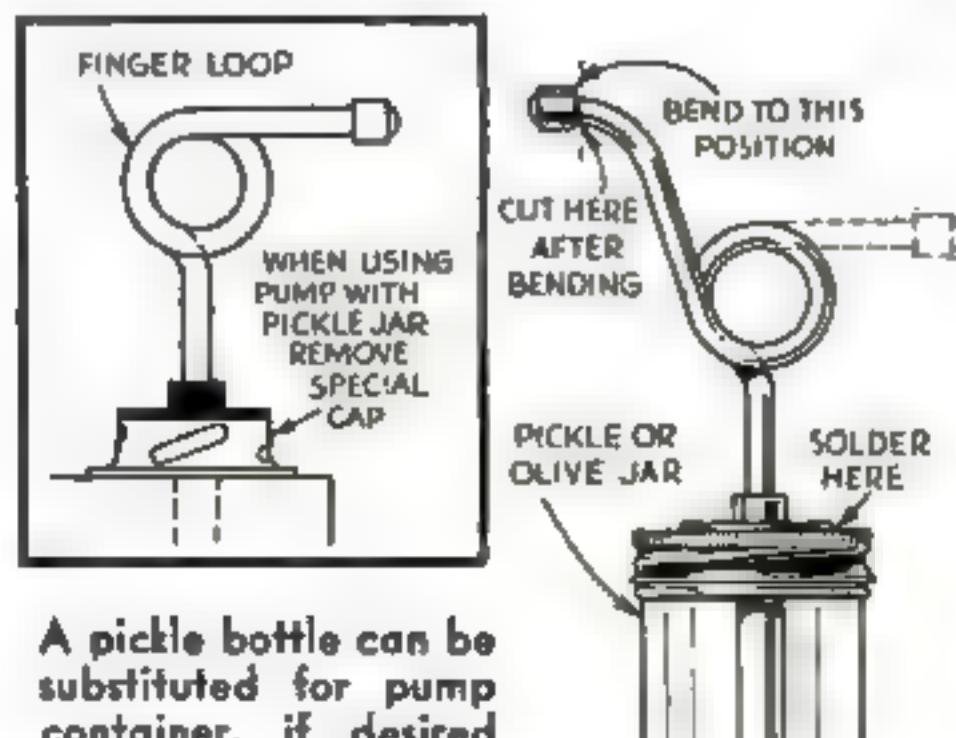
### Cigar Lighter Helps Defrost Windshield

IF AN electric cigar lighter is fastened to the guard of your vacuum or battery driven car fan, the fan will do a much more efficient job of defrosting the windshield. Mounted as in the illustrations at the right, the lighter serves to warm the air circulated by the fan. A short machine screw, with its round head set in a hole tapped in the end of the heater provides the means for connecting the unit into the car's battery circuit. The heater also helps to keep a driver's hands warm.—W. C. W.



How lighter is installed

### Homemade Gun for Refilling Shock Absorbers



A HANDY device that makes it easier to refill hydraulic shock absorbers, usually mounted in inaccessible places under the chassis, can be made from an old insect spray gun of the type operated by one finger. Bend the tube as indicated at the left, and saw off the tip. Fill the container with the fluid and remove the plug in the shock absorber. When the tube is inserted in the hole, it is only necessary to move the container up and down to inject the fluid, the altered insect-spray head serving as a pump.—J. B.

# Crime-Detection Tests



You can develop latent or invisible fingerprints on paper by the use of an iodine-vapor "gun" made from an ordinary chemical drying tube as shown at the left, or from a test tube

By  
RAYMOND  
B.  
WAILES

MORE and more, these days, we are hearing of the brilliant work of skilled chemists in clearing up baffling police mysteries. Tiny spots of blood, a few grains of dust in a suspect's trousers cuffs, burned writing that a crook has sought to destroy, yield their secrets to the test tube—and forge an alibi-proof chain of evidence to link the culprit to his crime.

Surely, you may suppose, chemical tests like these must be extremely difficult, and require complicated and expensive apparatus. It may surprise you to know that even an amateur chemist with the simplest of equipment can enjoy the thrill of duplicating many of them. Your own home laboratory will provide all you need to develop fingerprints and writing on charred paper,

A reagent made by dissolving silver nitrate crystals and nitric acid in water will discolor a counterfeit half dollar or quarter. At right, holding a piece of charred paper in chemical fumes to restore the writing upon it

SIMPLE EXPERIMENTS SHOW HOW POLICE EXPERTS FIND FINGERPRINTS, IDENTIFY BLOOD, AND SPOT BAD COINS

and to detect bloodstains, counterfeit coins, and other clues of the type that may play a crucial part in an important criminal trial.

Imagine that a notorious gangster, intending to destroy a damaging document, has consigned it to the flames of a fireplace—and only the charred remains are found. Could you restore the original writing? Suppose you try it and see. Write a few words upon a sheet of paper with pen and ink, touch a match to it, and let it burn to a crisp. Then hold one of the charred fragments over the fumes arising from a dish in which you have placed a small amount of hydrochloric acid mixed with potassium sulphocyanide (also known as potassium thiocyanate). If your ink was of a widely used type that reacts with these fumes, the writing will magically reappear upon the ashes of the paper.

Iron chemicals, employed in many familiar brands of ink, leave in burned paper traces that readily respond to chemical detection. Other common ingredients of ink include dyes and preservatives. Not all manufacturers use the same chemicals, and a sleuth may have to experiment with various different ways of developing the writing. Instead of the test just described, for example, you can try exposing the ashes to the vapor of ammonium sulphide solution, made by bubbling hydrogen sulphide gas through ammonium hydroxide until the solution no longer smells of ammonia. An-

other trick of the chemical detective is to press a charred document in contact with an unexposed photographic plate and leave it in the dark for several weeks. When the plate is developed, the original writing is likely to appear upon it, as a result of the chemical action of the ink upon the photographic emulsion.

Developing "latent" or invisible fingerprints offers another opportunity for you to exhibit your skill as a chemical sleuth. One of the methods that pro-



# for the Amateur Chemist

professionals use to render fingerprints visible, so that they may be photographed or otherwise recorded, is to "shoot" them with a device called an iodine-vapor pistol. You can readily make one for yourself from an ordinary chemical drying tube, also known as a calcium chloride tube. If you do not happen to have such a tube, a large test tube will serve, after you have cut off the closed end and fitted one of the ends with a cork carrying a short length of glass tubing. To this tubing, or to the small end of the calcium chloride tube, attach a piece of rubber tubing, which you will use as a mouthpiece for blowing.

The tube may now be filled with the necessary materials. Starting from the end into which you will blow, insert, in the following order, a little wad of absorbent cotton, enough granular calcium chloride to fill the tube to within one inch of the open end, a second cotton wad, a thin layer of iodine crystals or solid iodine, and a third wad of absorbent cotton.

To test your iodine-vapor pistol, rub your forefinger along your nose—the best place to collect traces of the sebum, or slight oiliness characteristic of human skin—and then press the finger upon a sheet of white paper. No visible mark will be left, if your face is clean. Now blow gently through your iodine-vapor pistol upon the spot, holding the open end half an inch or so from the paper. Soon the fingerprint

will be plainly seen. After trying this out a few times, you will find it entertaining to use your iodine-vapor pistol for detecting fingerprints upon envelopes received in the mail. Ordinary fingerprints will be fainter than your "artificial" prints, because the tips of the fingers normally secrete less of the oily substance than the skin of the face or scalp, but may nevertheless be detected with the pistol.

The chemistry of the process is almost as simple as the pistol itself. Its granules of calcium chloride absorb water vapor from the breath, and become warm in doing so. Your breath, already warm, is therefore further heated by the time it reaches the iodine crystals. These are vaporized and the iodine vapor, in turn, reacts with the sebum transferred to the paper from the ridges of your finger. The iodine will also attack the cotton in time, so it should be removed after your experiments and kept separately in a small, glass-stoppered bottle if the pistol is to be used

again at a later date. Meanwhile, air must be excluded from the calcium chloride by tightly stoppering it, or it will absorb so much water from the atmosphere that it will become liquid and useless for your pistol.

Dusting fingerprints with Victoria blue, a blue dye, or with "gray powder," a mixture of chalk and mercury, are other methods used to make them visible. Sometimes, instead, scientific detectives expose the prints to the vapors of warmed Fleming's reagent, or to contact with the liquid reagent itself. You can prepare Fleming's reagent by mixing together thirty cubic centimeters of a one-percent solution of chromic acid anhydride (red crystals) in water, eight cubic centimeters of a two-percent solution of osmic acid (osmic anhydride) in water, and two cubic centimeters of glacial (100-percent strong) acetic acid. When this reagent interacts with the substance left by the fingers, brown-colored reaction products (Continued on page 184)

## IDENTIFYING BLOOD

With an easily prepared reagent, you can find whether spots or stains contain blood. If blood is present, the stain will glow in the dark



This simple experiment demonstrates the principle on which toxicologists test vital organs for traces of arsenic



By  
MORTON C. WALLING

**A**BSOLUTELY all wool," the salesman declares, displaying a suit. You finger the material and nod vaguely. The pattern and the cut appeal to you, so you buy the suit, greatly pleased with yourself for getting a bargain.

Perhaps the salesman is telling the truth. On the other hand, his natural anxiety to make a sale may have betrayed him into a slight exaggeration. You may notice, when you start wearing the suit, that it holds a crease for only a few hours after being pressed. The rest of the time, it looks as though you had been making it do double duty as pajamas. Gradually the idea dawns

# GET THE GOODS ON FABRICS WITH YOUR *Microscope*

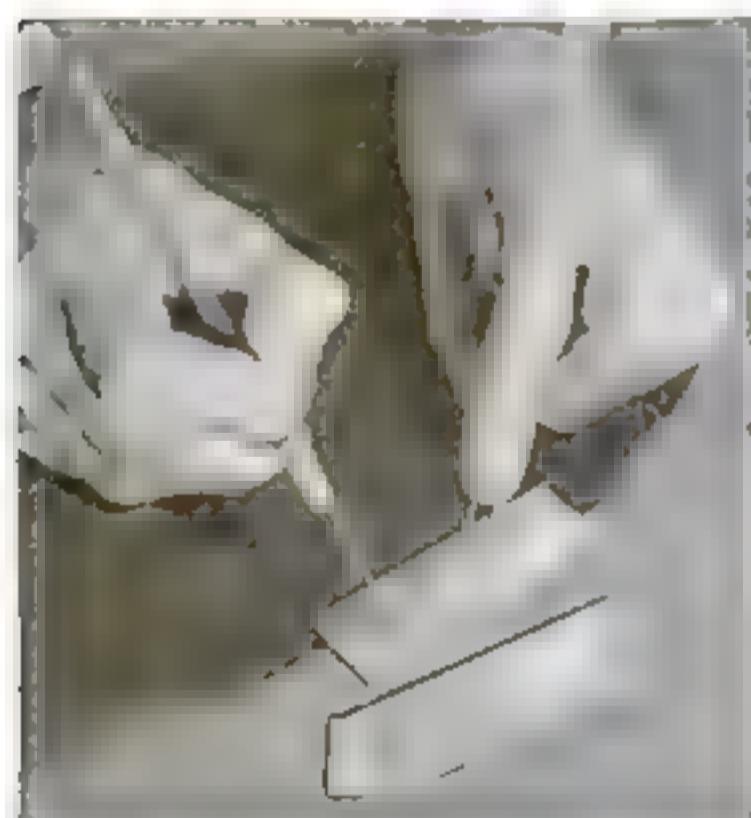
Samples of cloth being checked for uniformity of thread size and spacing. Photomicrographs at right, above, show fibers of silk, wool, and linen as they appear when magnified. Note their distinguishing qualities

on you that there is something wrong.

And that's where your microscope comes in. Snip a piece of excess cloth from one of the cuffs of the trousers, and lay it on a slide. With the instrument set for fifty diameters, you will see a network of threads spaced surprisingly far apart. However, a general

inspection of the cloth in this way will tell you little. To get the real low-down on the fabric, you must tease a few threads out of the sample with a pair of dissecting needles and separate some of them into their individual fibers.

Lay a clean cover glass over the threads and examine them at a higher



To prepare a piece of cloth for examination, first tease out individual threads and fibers



Adding xylol, water, or other liquids often makes fibers more transparent, improving etc.



For staining, textile dyes or standard microscope stains will be found to serve the purpose



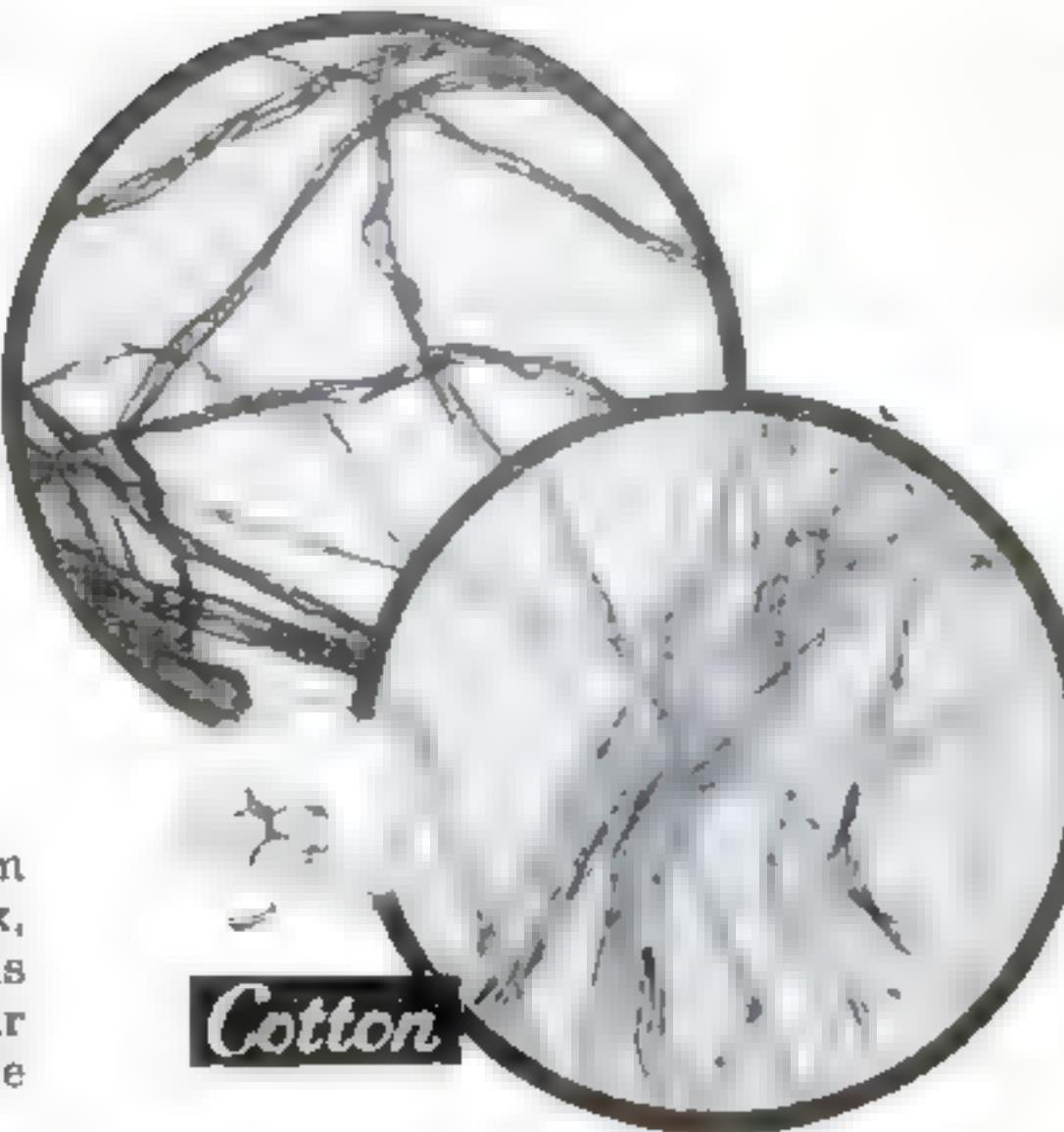
Finished slides should be labeled neatly and filed away for future reference and comparison

magnification than you used for the sample of cloth. Add water or xylol to increase their transparency. Probably you will see two different kinds of fibers, one cylindrical in shape with a scaly surface, the other resembling a flat, twisted ribbon. If you do, your worst suspicions regarding the suit are justified. The scaly, cylindrical fibers are wool, the twisted, ribbon-like ones cotton.

Identifying textile fibers is one of the most fascinating things you can do with a microscope. It becomes a simple matter, after a little experience, to distinguish cotton from wool, wool from linen, linen from silk, and silk from the various rayons. It is but a step farther to become familiar with a wide variety of other textile fabrics.

Examination of fabric construction is another important operation. With the familiar "linen tester," a simple microscope whose stand is equipped with a scale, the number of threads to the inch in a sample of goods can be determined accurately, and major imperfections discovered. At the higher magnifications given by a compound microscope, much more can be learned about uniformity of weave, variations in thread size, and damaged fibers and threads.

At magnifications high enough to reveal details of the individual fibers,



Cotton fibers, showing the characteristic resemblance to flat, twisted ribbons. In the lower picture, xylol has been applied

various things affecting the quality of a material can be seen. Thus, the fibers may show numerous breaks and fractures, as a result of careless processing. When the material is composed of two or more kinds of fibers, the relative amounts can be estimated closely with the microscope, or separated and weighed for more exact determination. Dye action can be examined with the

microscope. Thus it may be discovered that a certain woolen material takes dye poorly because the interior tissues, called medullary canals, in the individual fibers, are closed.

The technique of making microscopic examinations of textiles is not at all difficult. In fact, cloth is one of the best materials for the beginner to use

in becoming familiar with the handling of his microscope. It requires but a few seconds to cut a piece of fabric to the size of your little finger nail, lay it on a clean slide, and start examining it at any convenient magnification.

It is wise to examine each textile specimen in both dry and wet mounts. A dry mount is made simply by placing a specimen of cloth on a clean slide. It may be desirable to lay a cover glass over it, to hold it flat and in position. Always tease out several threads at one edge, and tear them apart to reveal the individual fibers, when you intend to examine the detailed structure of the specimen.

After you have studied the specimen in its dry state, try wetting it with water. Simply place a drop or two of water at the edge of the cover glass, and let it soak into the piece. Use enough water to eliminate air bubbles, but not enough to make the cover glass float. You will note that the cloth appears more (*Continued on page 181*)

## Know Your Instrument

**T**O GET the most out of books and articles on microscopes, you should be familiar with the language of the subject. Thus, when somebody speaks of the "ocular," you will know that he means the lens or system of lenses at the top of the microscope tube, to which you place your eye when you look through the instrument. The ocular also is known as the eyepiece. Other important parts of a compound microscope are:

**Objective**—the lens or system of lenses at the lower end of the body tube, directly above the object.

**Body tube**—the metal tube that acts as a support for objective and eyepiece lenses, and forms a light-tight housing for them.

**Revolving nosepiece**—a disk-shaped attachment at the lower end of the body tube, into which the objectives screw. Pivoted, it revolves to bring objectives into position.

**Base**—the casting, usually shaped somewhat like a two-toed bird's foot, that rests on the desk or table top and acts as a support for the rest of the instrument.

**Arm**—this is the rigid member that is pivoted to the base, and to which are fastened the various other parts.

**Inclination joint (pivot)**—the joint between arm and base, which permits the microscope to be broken over at an angle for more comfortable observing.

**Pillar**—this is a projection from the base, to which the arm is pivoted. The pillar and the part of the arm nearest it resemble a hinge assembly.

**Stage**—the platform, with a hole in the center, on which glass slides are laid.

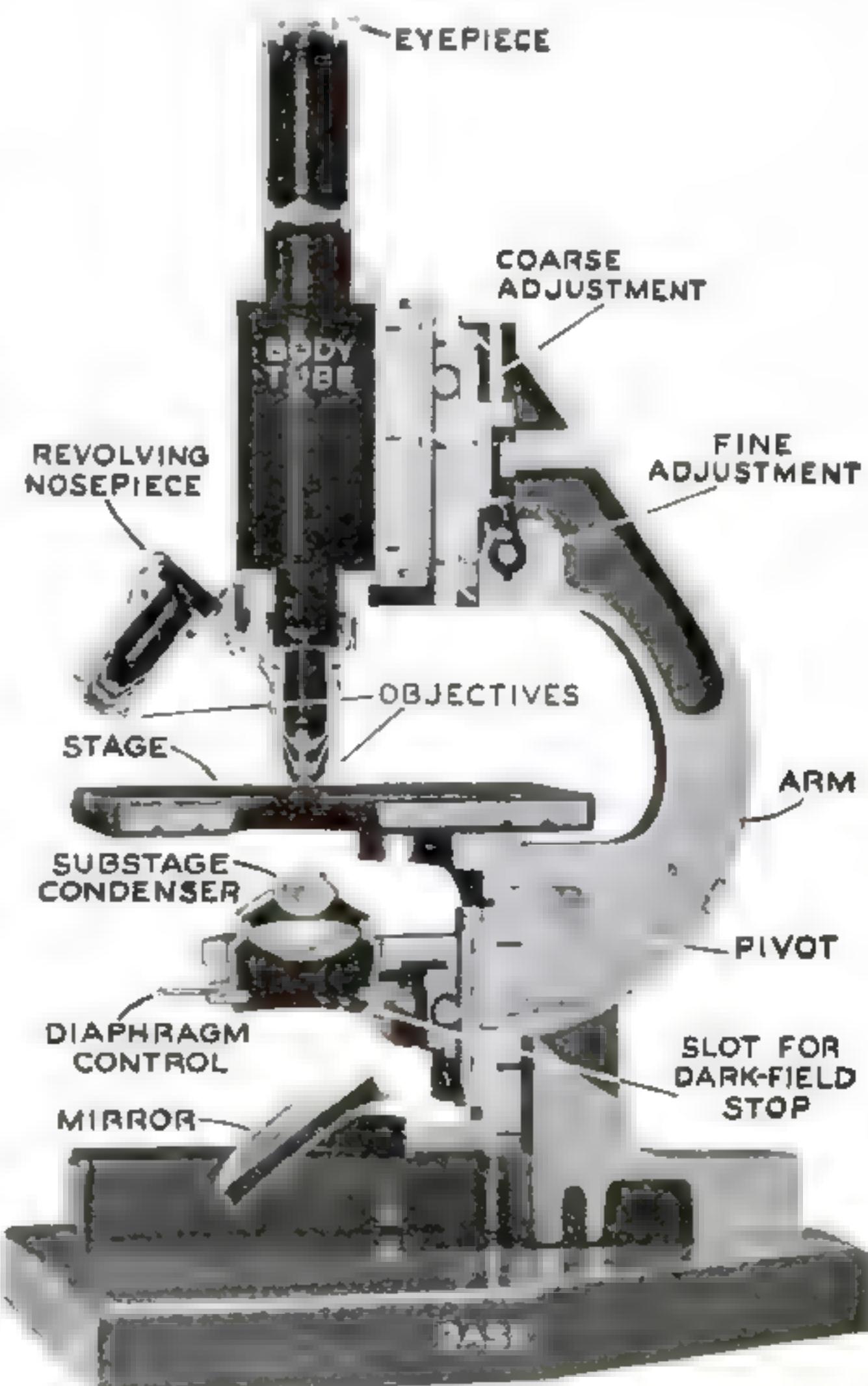
**Substage**—the assembly of accessories beneath the stage, including the substage condenser (Abbe condenser), iris diaphragm for controlling the diameter of the light beam reaching the object, and a mirror for reflecting light up to the object.

**Substage condenser**—a system of lenses designed so that they concentrate a beam of light on the object.

**Spring clips**—two flat pieces of springy metal, pivoted at one end, for holding the slide in position on the stage.

**Coarse-adjustment knob**—a knurled knob by which rough focusing is done; it produces considerable body-tube movement at each revolution.

**Fine-adjustment knob**—a vernier knob that produces only slight movement of the body tube at each revolution.





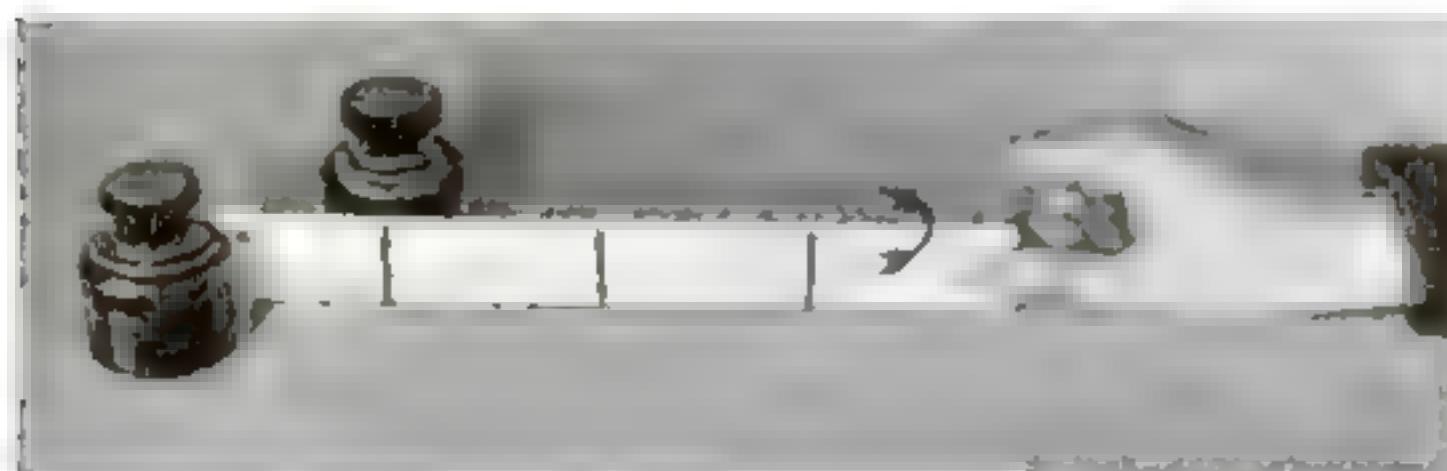
## Artificial Rainbow Shows How Real Ones Are Made

TO SEE how rainbows are formed, you can produce one on your living-room table. Set up a lamp to throw a strong beam of light through a hole in a screen as seen at the left. Fill a small flask or clear lamp bulb with water, to represent a huge raindrop, and hold it in the beam of light in front of the screen. The light entering the water will be refracted and reflected to form a beautiful circular rainbow on the screen. The colors of the spectrum will appear in their proper order, with violet on the outside of the ring, as seen in the rainbows of nature.

# FIVE STUNTS FOR THE Home Experimenter

### Stunt Demonstrates Lever Action

PLACE two ink bottles of similar weight on a table and use a ruler as a lever, as illustrated below. When the ruler is moved as indicated by the arrow, the bottle at the end of the ruler will remain stationary, and the other will move. You can figure out the cause for yourself by considering each bottle in turn as fixed, and acting as a pivot. The force against one is four times the force exerted by the hand, while against the other it is only three times the force exerted by the hand.



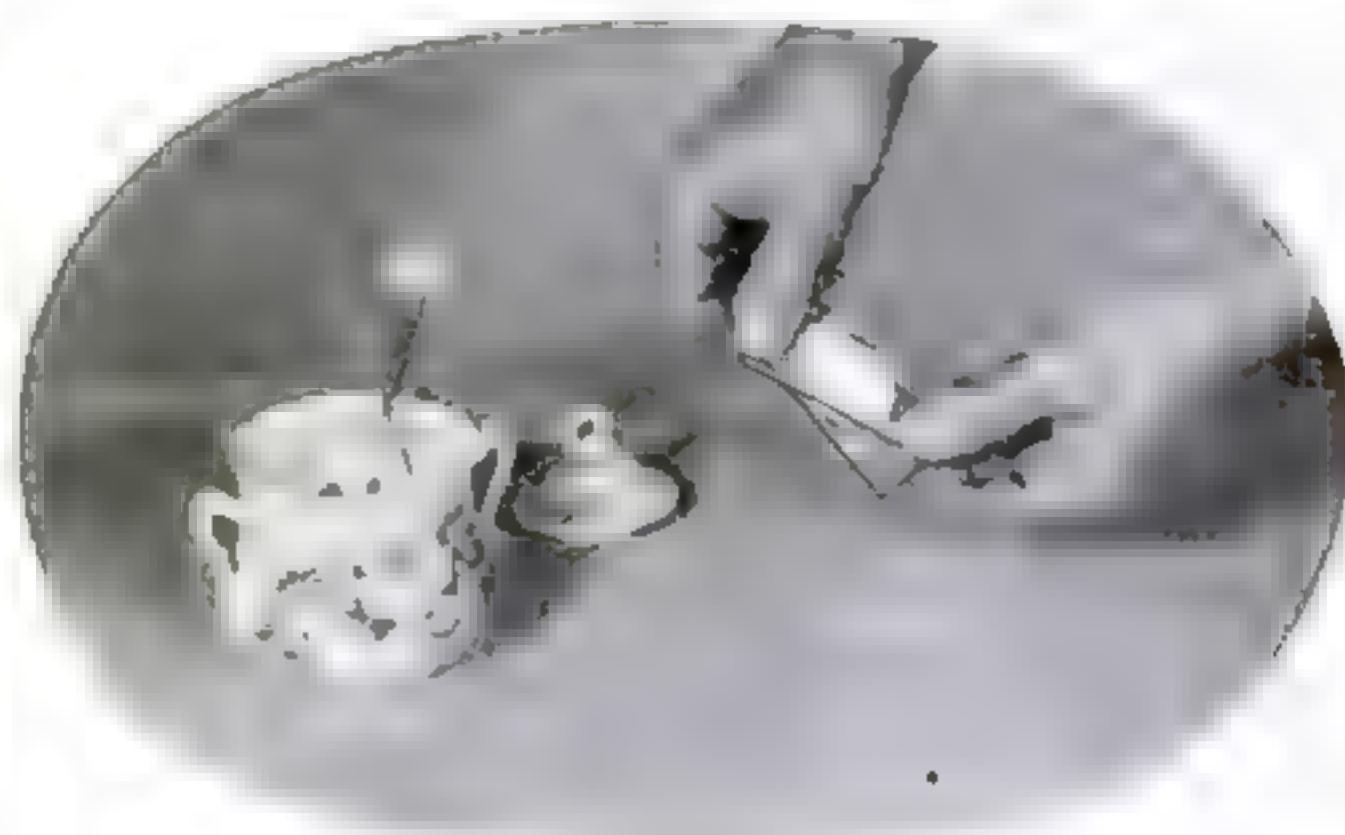
### Mirror and Models Make Mock Mirage

ONE type of mirage, in which ships or other distant objects are seen apparently floating upside down in the sky, can be reproduced with the aid of a large mirror. The glass is supported, reflecting side down, a few inches above the surface of a table. It reflects the images of tiny model ships, just as layers of warm air far above the earth sometimes reflect distant scenes.



### Glass Transmits Light, but Not Heat

WHEN you hold your hand near the base of a hot electric iron, you can feel the invisible heat radiations distinctly. However, if you interpose a piece of ordinary window glass between your hand and the iron, as shown in the photograph, the warmth is cut off. The reason is that heat rays, while generally similar to light rays, are composed of longer waves. Glass transmits the waves of light, but allows only a little heat to pass through.



### Crushing Sugar Produces Light

IN A dark room, grind a pinch of ordinary sugar between two pieces of glass and you will see it glow momentarily with a faint light whenever pressure is applied. The crushing force sets the electrons, or tiny electrified particles, vibrating in the sugar, causing them to send out light waves.

# KIT OF IDEAS FOR Radio Fans



This portable phonograph has a built-in amplifier and dynamic speaker

## Handy Chassis Holder Aids In Repair Work

DESIGNED to aid the radio builder, a novel chassis holder consisting of thirty-six wooden rods and bases, makes it possible to turn a radio chassis upside down on a workbench without danger of damaging delicate parts. Rods of appropriate length are selected, placed in their bases, and the chassis rested upon them so as to hold all parts above the bench top while repairs are being made. An extra base is provided for storing the rods according to size.



Odd-length rods support the set for repairs

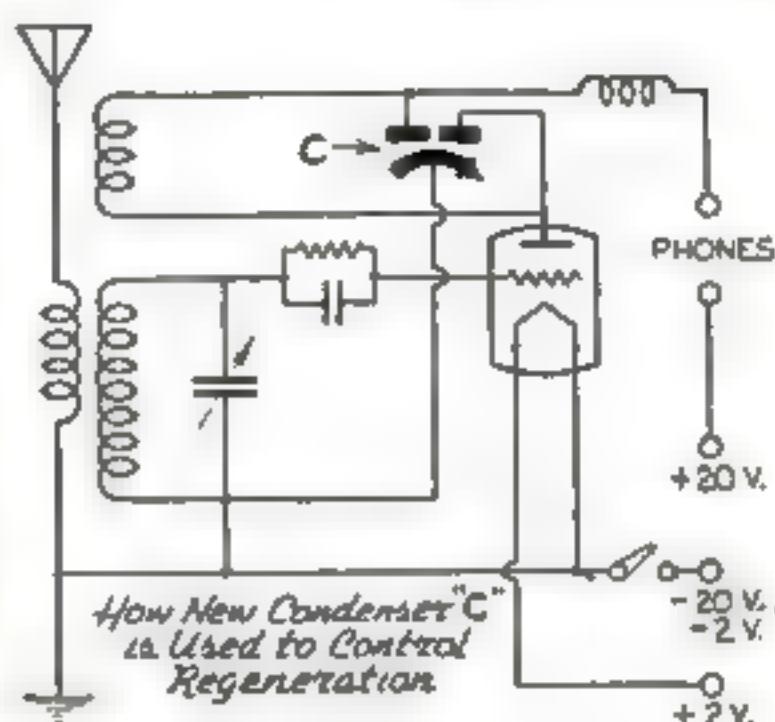


## Knock-Down Switches Have Many Uses

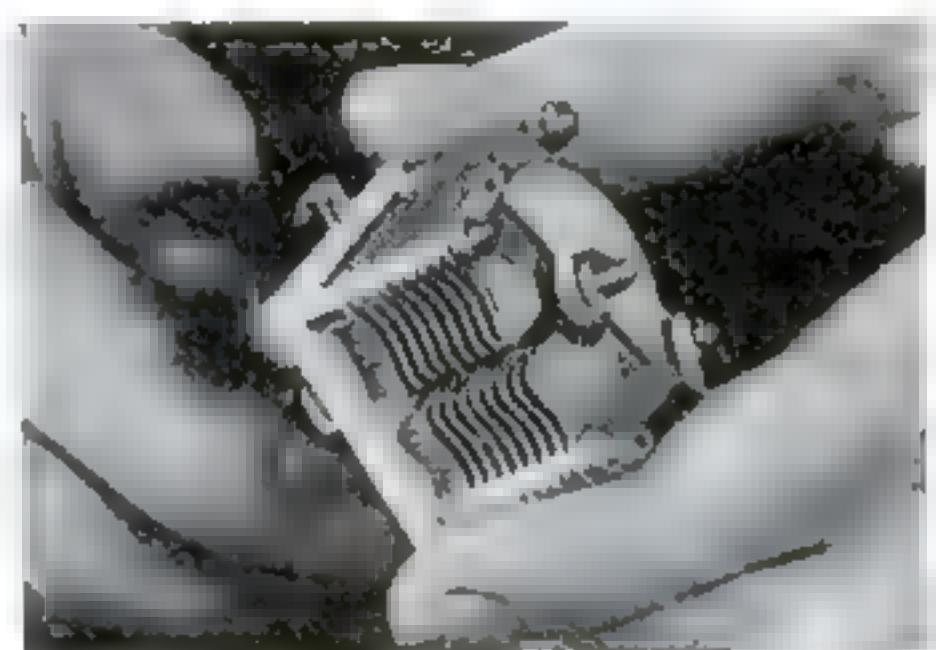
SELECTOR switches now available in knock-down form can be assembled to fit any of the radio hobbyist's needs by providing 204,156 different switching combinations. Low resistance and positive contact are assured by contact clips having double jaws set at sharp angles to bite through accumulated dirt.

ALTHOUGH little larger than an ordinary portable typewriter case, the compact electric phonograph shown at the left contains a built-in three-tube amplifier and a six-inch dynamic-speaker unit. Capable of playing either ten or twelve-inch records, the machine utilizes a crystal pick-up, measures only 7½ by 11 by 18 inches, and weighs but eighteen pounds.

## New Regeneration-Control Unit



HAVING two sets of fixed plates instead of the conventional one, the novel variable condenser below provides a new means of controlling regeneration and insures more stable oscillation than can be had with the ordinary variable resistor or condenser. As in the diagram, one set of fixed plates is connected to one side of the tickler coil, and the other to the plate. The movable plates are wired to the ground or chassis. The result is a continuous, variable by-passing effect in the output circuit.



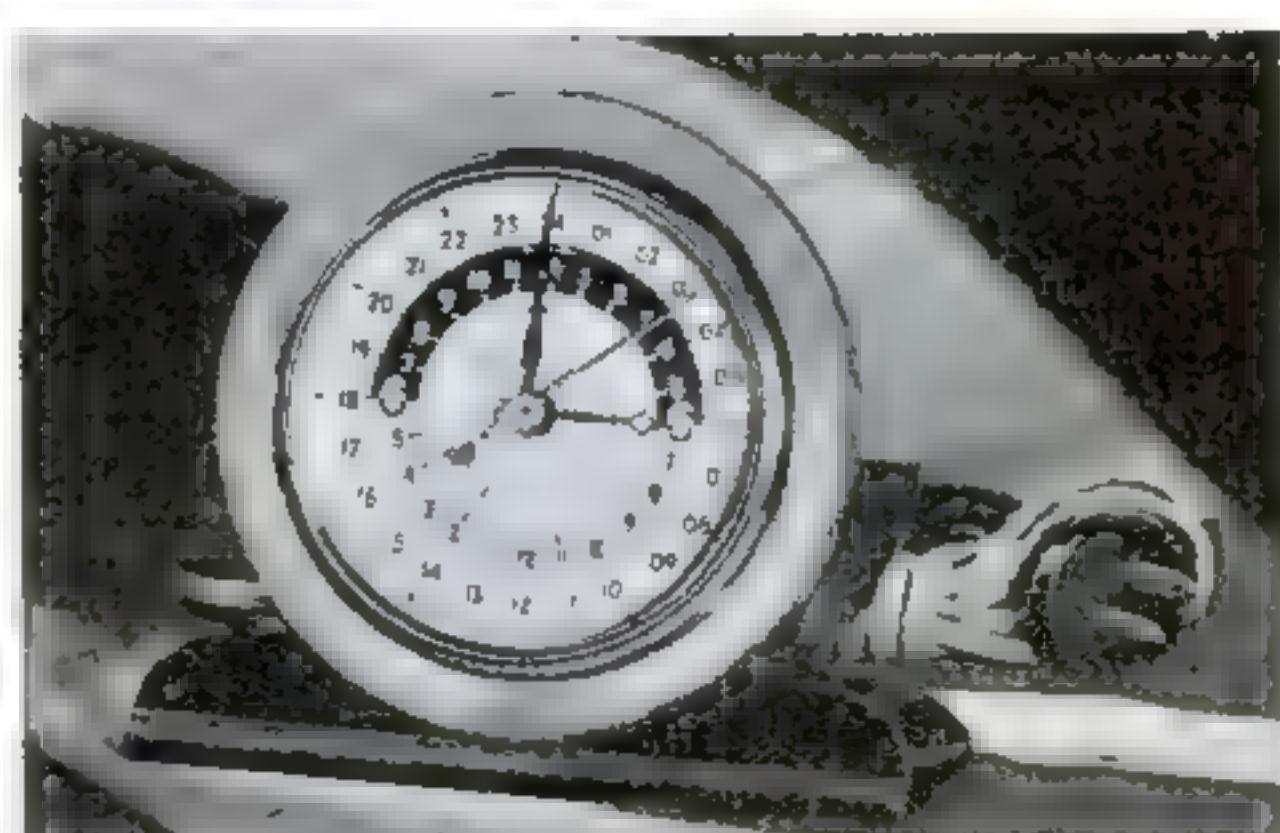
How the two sets of fixed plates are arranged

## Coloring Dial Lights

DIAL lights can now be tinted any color desired. Kits available to set builders contain quick-drying liquid dye in a range of colors.

## Clock Gives Time for Any Part of the World

KEEPING POSTED on time schedules of radio stations in any of twenty-four time zones around the globe is facilitated by a new electric clock designed especially for use by short-wave fans. Colored dials, plainly marked with standard and Greenwich mean time scales, indicate the local standard time in twenty-four principal countries and cities, and a set of instructions includes a chart for telling time in countries not shown on the clock.



Colored dials on clock aid DX fans who hunt foreign programs

# Novel Pillow

## GIVES 'SILENT'



The pillow radio forms a handy bedside receiver. The speaker unit is built into a small sponge-rubber pillow as illustrated at the right.

**B**ECAUSE it allows the radio fan to listen to his favorite program in bed or in his favorite arm chair without disturbing the rest of the family, this inexpensively built pillow radio will form a valuable addition to the radio equipment in any household. Operating on either alternating or direct current, it provides "silent" reception that can be heard only by the user.

As shown in the photographs, the outfit consists of two main parts—the speaker unit and the receiver. The receiver circuit can be easily assembled from standard parts, and the speaker, a sponge-rubber pillow with a built-in reproducer, can be purchased for a few dollars from almost any large dealer in radio parts.

Although only three tubes are employed, the use of a combination power pentode and half-wave rectifier (12A7) provides the tuned radio-frequency circuit with surprising sensitivity and volume. In tests, made in a crowded eastern city, the author was able to bring in stations more than two thousand miles away with good volume.

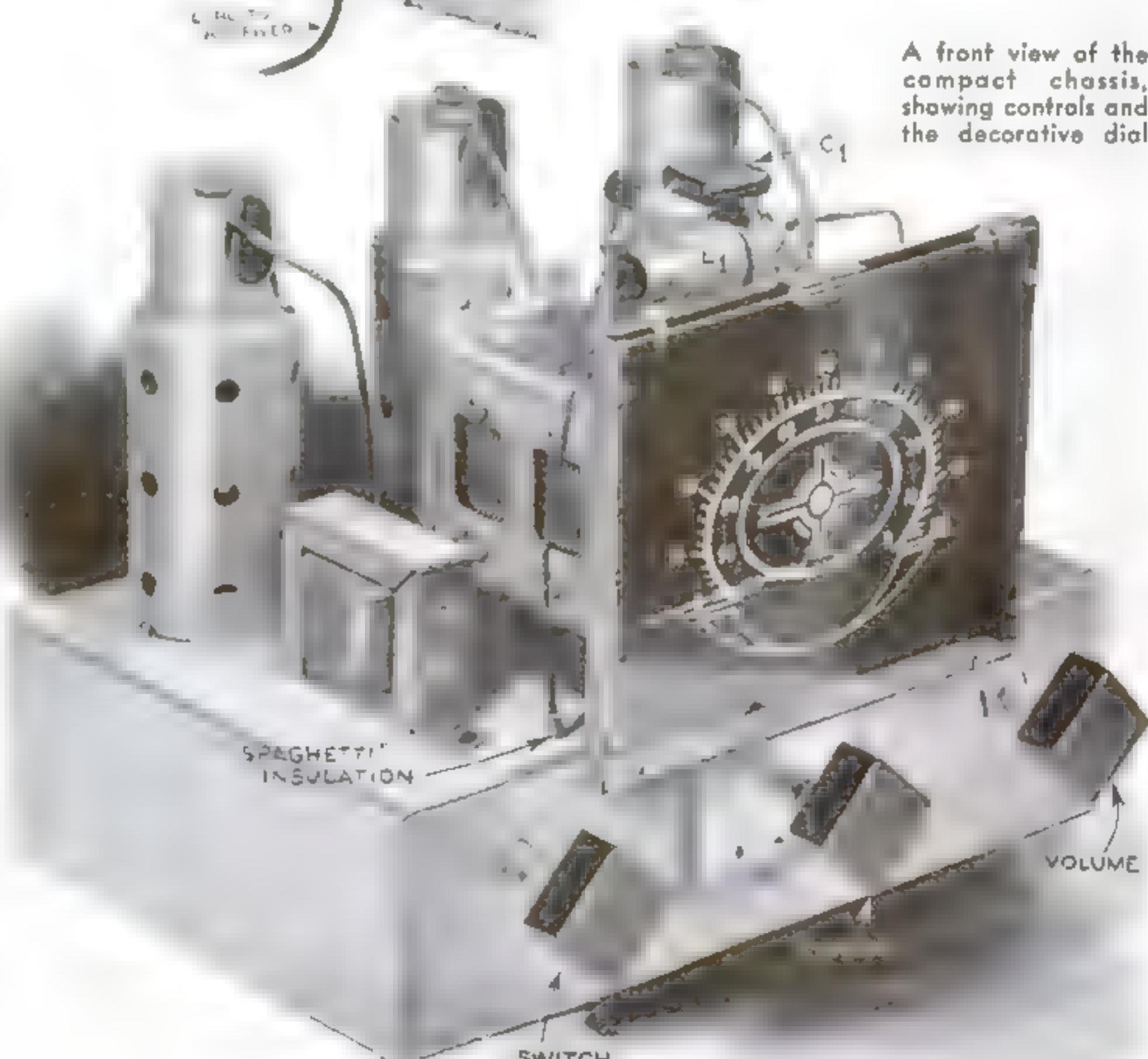
In studying the diagram, you will note that an output transformer ( $T_1$ ) is used in the plate circuit of the 12A7 output tube. This is essential in this type of receiver for two reasons: First, the pentode must be properly matched to the 2,600-chm speaker unit in the pillow; and second, high voltages must be confined to the set, and not be allowed to flow through the eight-foot

output cord to the speaker in the pillow.

The chassis, measuring nine inches in length, six inches in width, and two and one-half inches in height, can be cut easily from sheet aluminum. Three holes should be drilled in the front edge of the chassis and three in the rear. These serve to take the three control shafts, the speaker jack, the antenna, and the power cord. When mounting the jack, make sure that it is well insulated from the chassis with washers.

The ganged tuning condenser ( $C_2$ ), the antenna coil ( $L_1$ ), the filter choke (Ch.), the output transformer ( $T_1$ ), and the three tubes should be mounted on the top face of the chassis, while the various smaller parts and the wiring can be placed on the underside. All wires passing through holes in the chassis should be protected with "spaghetti" insulation to avoid any possibility of a short circuit.

Neither the placing of the parts nor the wiring should cause the amateur set builder any great difficulty. There are just three precautions—be sure that the radio-frequency coil is well shielded from the antenna coil, shield the grid-cap wires leading to the two high-frequency pentode tubes (6D6 and 6C6), and see that all

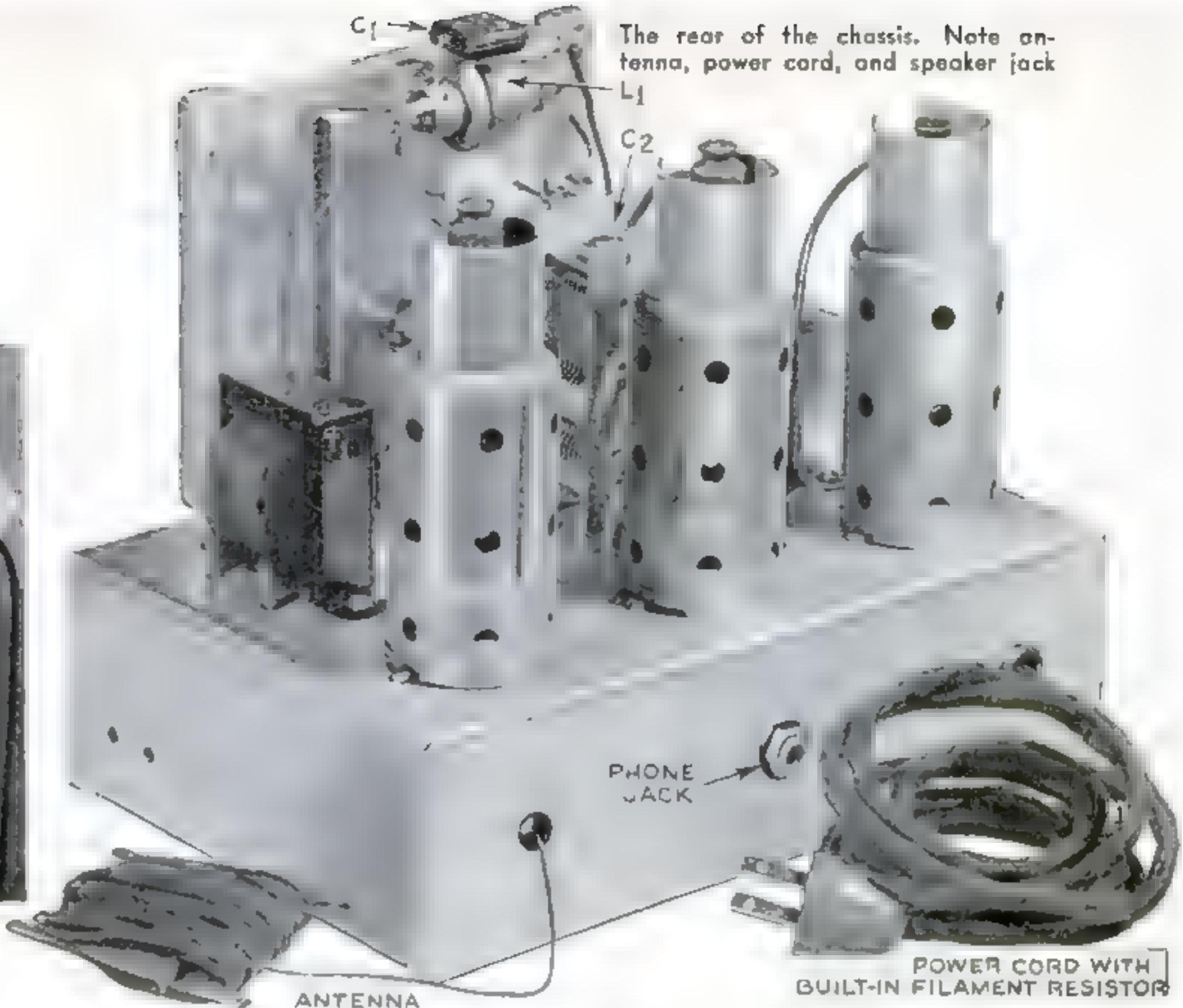


A front view of the compact chassis, showing controls and the decorative dial.

# Radio RECEPTION

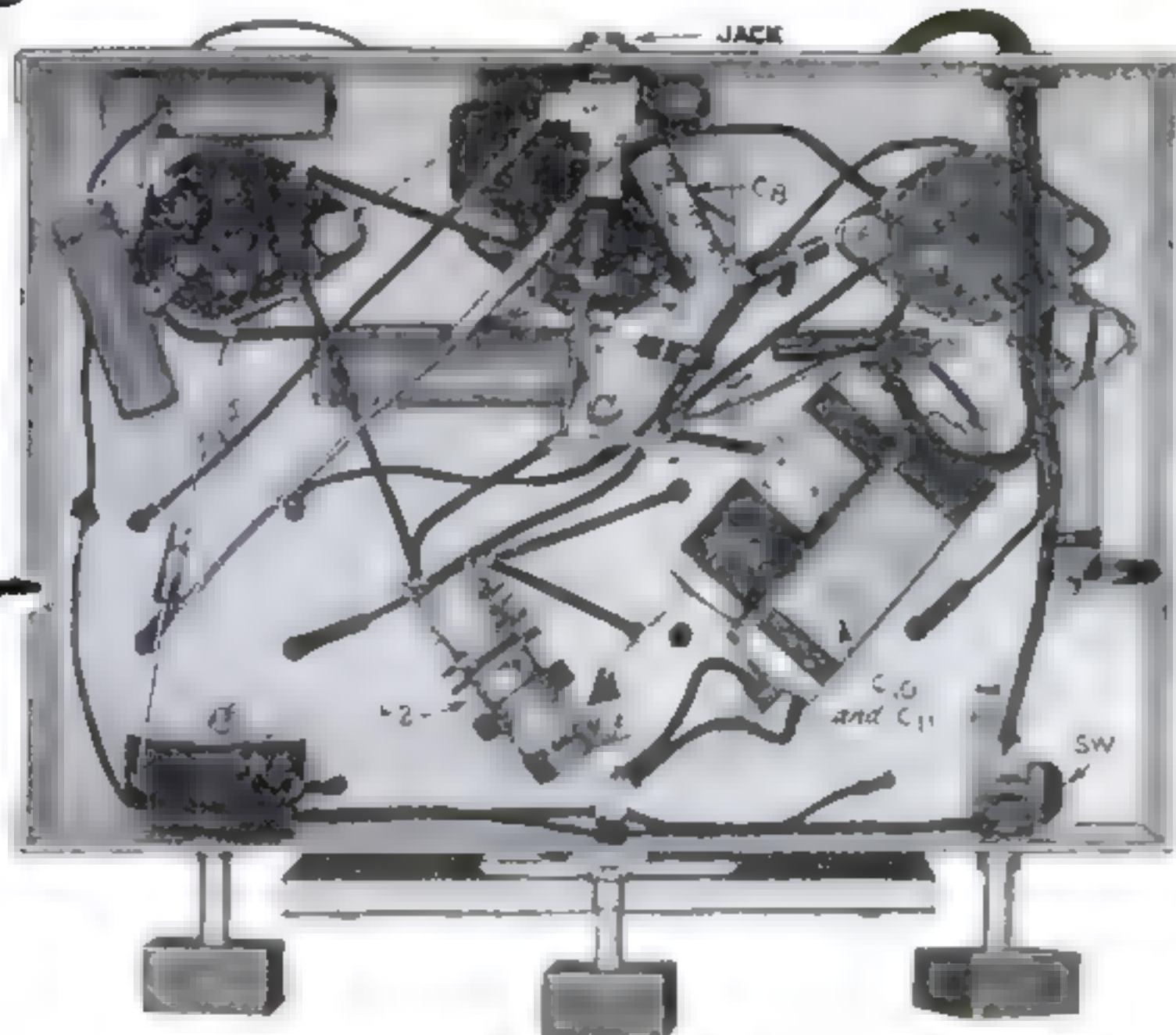


Used as a head rest for an arm chair, the pillow speaker will give you "silent" reception in your living room



POWER CORD WITH  
BUILT-IN FILAMENT RESISTOR

By  
**BILL  
W.  
NORTON**



This view under the chassis reveals the wiring of resistors and fixed condensers

of the leads are as short as possible. Modernistic in appearance, the cabinet can be easily built by anyone handy with woodworking tools. Inside, it should measure 7 by 7½ by 9½ inches to take the chassis. The top, sides, and bottom can be cut from three-eighths-inch pine, while the front panel can be quarter-inch plywood. When completely assembled with nails and glue, the cabinet should be sanded and coated with an application of thin shellac. For the final finish, apply one coat of ivory-colored brushing lacquer.

For those who do not wish to use the pillow speaker, ordinary headphones or a conventional loudspeaker can be substituted. Several types of balanced-armature magnetic speakers are available in wood cabinets that can be easily refinished to match the receiver.

Operating on the familiar A.C.-D.C. principle, no external ground should be used. A forty or fifty-foot antenna will serve adequately in most cases.

The rear of the chassis. Note antenna, power cord, and speaker jack

L1

C2

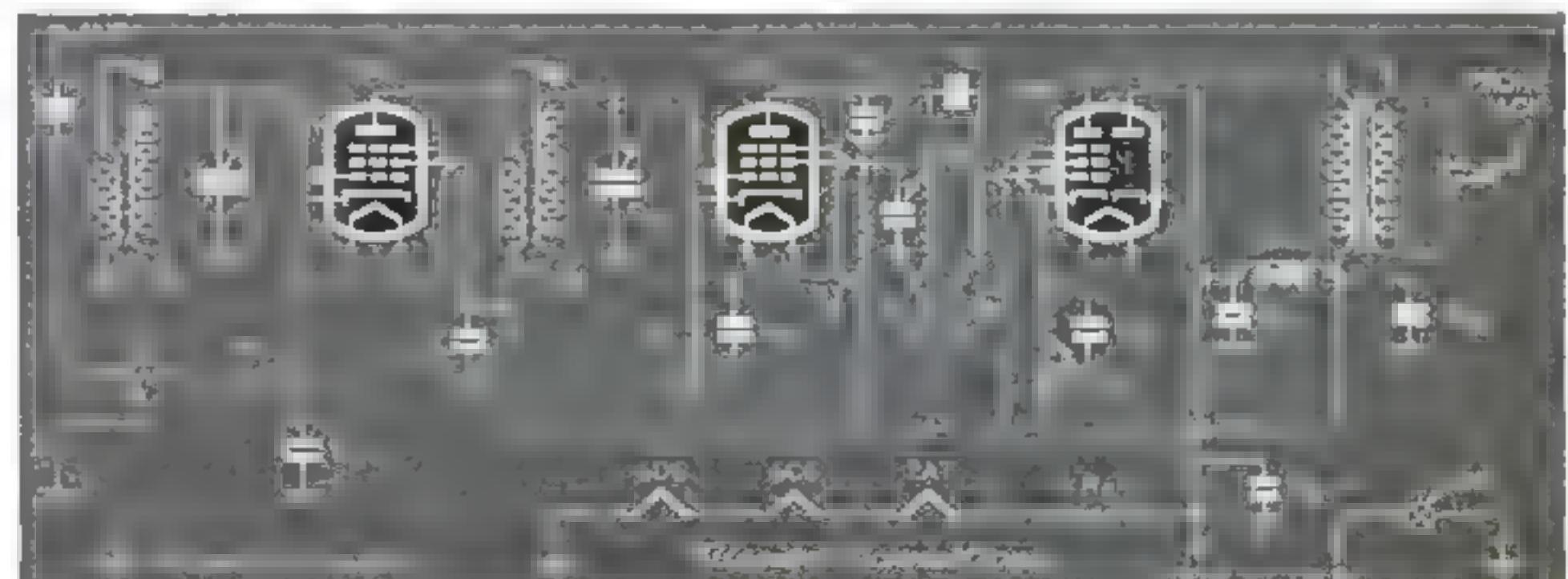
C1

PHONE JACK

ANTENNA

## LIST OF PARTS

- C<sub>1</sub>—Condenser, mica, .001 mfd.
- C<sub>2</sub>—Tuning condenser, two-gang, .000365 mfd.
- C<sub>3</sub>, C<sub>4</sub>, C<sub>5</sub>—Condensers, tubular, .1 mfd.
- C<sub>6</sub>—Condenser, tubular, .25 mfd.
- C<sub>7</sub>—Condenser, mica, .0005 mfd.
- C<sub>8</sub>—Condenser, tubular, .02 mfd.
- C<sub>9</sub>—Condenser, tubular, .05 mfd.
- C<sub>10</sub>, C<sub>11</sub>—Electrolytic condenser, dual, 8-8 mfd.
- C<sub>12</sub>—Electrolytic condenser, 5 mfd., 50 volts.
- R<sub>1</sub>—Volume control, 15,000 ohms.
- R<sub>2</sub>—Resistor, 300 ohms.
- R<sub>3</sub>—Resistor, 50,000 ohms.
- R<sub>4</sub>—Resistor, 2 meg.
- R<sub>5</sub>—Resistor, 250,000 ohms.
- R<sub>6</sub>—Resistor, 500,000 ohms.
- R<sub>7</sub>—Resistor, 1,500 ohms, 1 watt.
- Miscellaneous.*—Chassis, cabinet, jack, tubes and shields, dial, knobs, sockets, power cord with 310-ohm resistor (R<sub>8</sub>), antenna coil (L<sub>1</sub>), radio-frequency coil (L<sub>2</sub>), output transformer (T<sub>1</sub>), filter choke, 15 H. (Ch.), switch. Note: R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, and R<sub>6</sub>, are  $\frac{1}{2}$  watt.



Amateur radio builders will have little trouble constructing this simple, three-tube hook-up

SPAN THE WORLD

WITH THIS

# GLOBE RECEIVER

By

FRANK TOBIN



Mounted on top of the set, the globe quickly shows the locations of stations

**D**EIGNED for the short-wave fan who goes after long-distance reception, the receiver illustrated is decorated with an attractive and useful globe of the world. With it, the location of every new station logged can be quickly and easily spotted to show the listener just where the message originates.

For ease of construction, the circuit used is a conventional two-tube, plug-in coil arrangement consisting of a type '30 detector coupled through an audio transformer to a type '30 amplifier. To insure adequate selectivity, a .0005-mfd. trimmer condenser is included in the antenna input. If an extremely short antenna is used, this auxiliary condenser can be eliminated or temporarily shorted out of the circuit.

Although a forty-five-volt plate current generally is employed in circuits using a '30 detector, tests have shown that smoother regeneration in this particular circuit results when the detector plate current is limited to twenty-two and a half volts. In the amplifier circuit, however, the full forty-five volts is recommended.

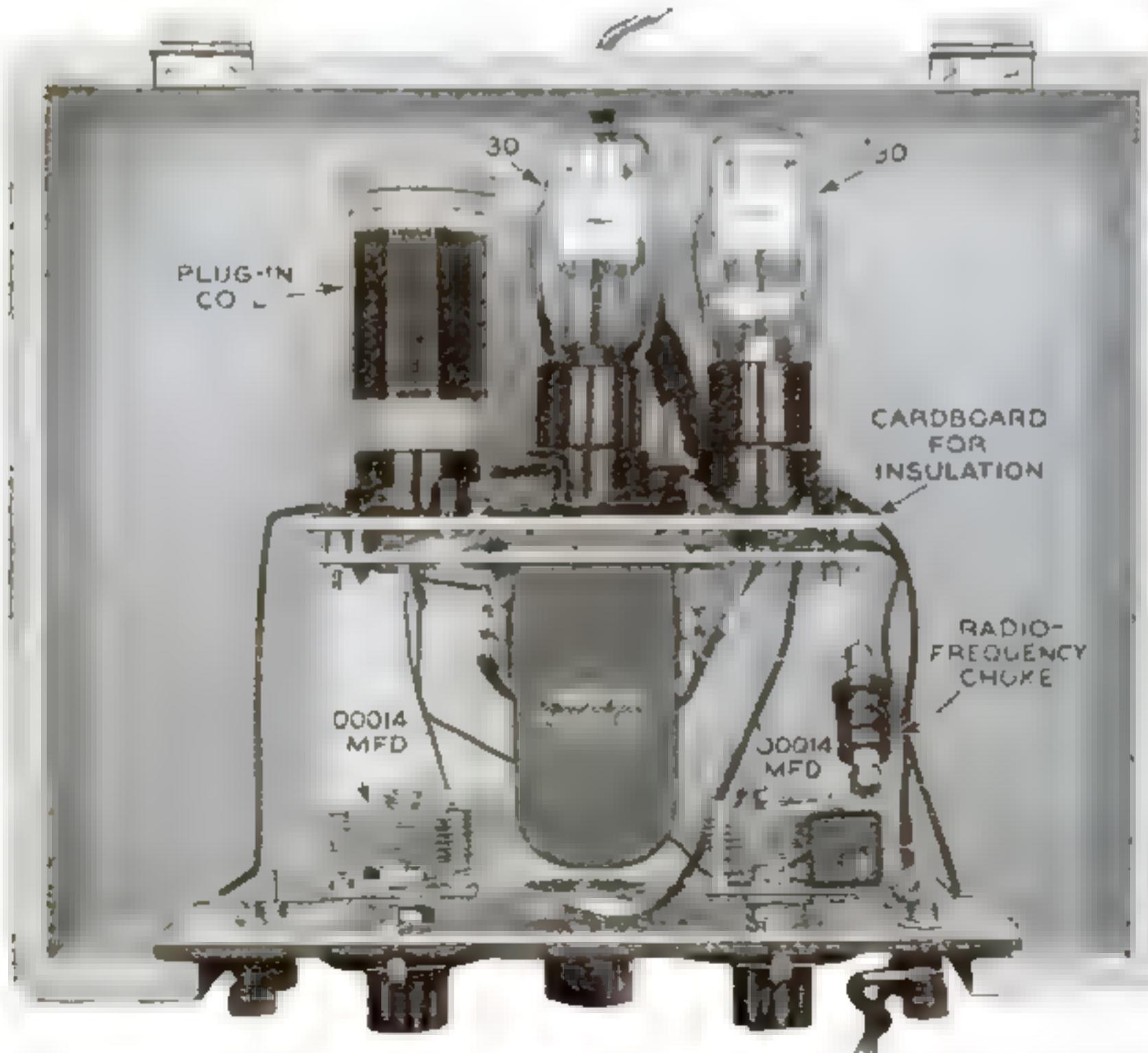
Because of the necessarily flat shape of the cabinet, a special chassis was designed. As shown in the photographs, it consists of an L-shaped piece of aluminum, two rectangles of aluminum, a rectangle of cardboard, a rectangle of composition paneling, and four brass spacers. The rectangle of card-

A set of four plug-in coils enables this receiver to cover all of the shortwave lengths

board is used as insulation for the tube and coil sockets.

The cabinet, constructed of three-eighths-inch pine, is easily assembled. Any suitable finish may be applied. On the original shown, I used two coats of mahogany varnish stain.

When you (*Continued on page 130*)



How the plug-in coils are changed, and, at the left, top view of the cabinet with lid removed to show arrangement of tubes, transformer, and condensers

# *DO EXPERT MARKSMEN FIND THAT CAMEL'S COSTLIER TOBACCOS MAKE A DIFFERENCE?*

"**YES, SIR**, in any bunch of expert shots — Camels are the favorite cigarette," says Ransford Triggs, one of the foremost marksmen in America. "Marksmen know that it takes steady nerves to make high scores. And the fact that Camels don't frazzle my nerves goes over big with me. I smoke plenty of Camels every day, too."

And millions of other people — the most loyal group of smokers in the world — put their "O. K." on Camels too — making Camels the largest-selling cigarette in America

TAKING X-RAYS is a delicate job—and a tiring one too. But as Miss Myrtle Sauler, X-ray technician, says: "When I'm tired, a Camel refreshes me. I get a 'lift' with a Camel."

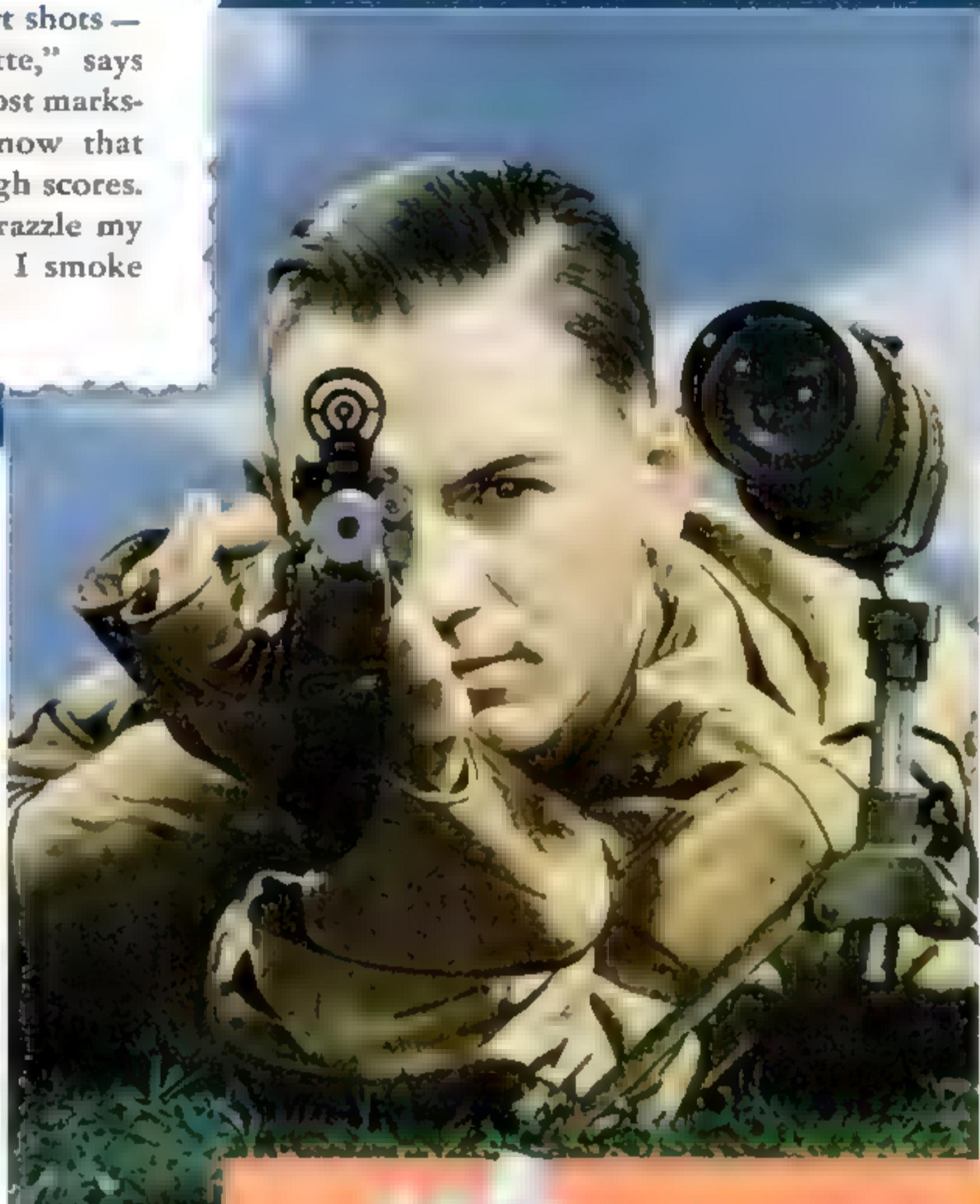


"I'M HANDLING money by thousands," says bank teller, John McMahon. "Jittery nerves don't fit in with this work. So it's Camels for me."



HOME economist, Elizabeth May, says: "There's a world of comfort in smoking Camels 'for digestion's sake,' at mealtimes."

{ ABOVE } Head-on view of Ransford Triggs on the firing line. His .22 calibre rifle is equipped with hand-made sights. He uses the sighting 'scope beside him to help get his sights set exactly for the centre of the bull's-eye. The glove helps protect his hand.



Camel pays millions more for COSTLIER TOBACCOS! Camels are a matchless blend of finer, MORE EXPENSIVE TOBACCOS — Turkish and Domestic.

# CAMELS

THE LARGEST-SELLING-CIGARETTE IN AMERICA

Copyright, 1937, B. J. Reynolds Tobacco Company, Winston-Salem, N. C.

# "There They Would Have Stayed...and Frozen!"

Dog Brings Aid to Family Marooned After Icy Plunge

Mrs. W. J. Murtha  
Baldwin, Wis.



"THE CLOCK struck two as I got up to see if the baby was covered," writes Mrs. W. J. Murtha, R.F.D. 3, Baldwin, Wis. "Outside a light was flashing...down toward the frozen, flooded river bottom where the highway dips close to the shore and the road lay as much as six feet under ice and water. Instantly I thought, 'It's finally happened. A car has broken through!'

"I called my family. We threw on some wraps and hurried down there with our flashlight and our police dog, Rex.

## "EVEREADY" BATTERIES ARE FRESH BATTERIES

FRESH BATTERIES last longer...

look for the DATE-LINE

NATIONAL CARBON CO., INC.,  
30 East 42nd St., New York City

Once more the  
DATE-LINE  
is a LIFE-LINE



"Sure enough, a car had broken through the thin ice where the road was flooded. Four people stood marooned on its top, clinging together in terror while one signalled frantically with his flashlight. We returned the signal with our own light, and soon as we were near enough, called to them to stay where they were. We feared they might try to walk back on the ice, and that would be suicide.

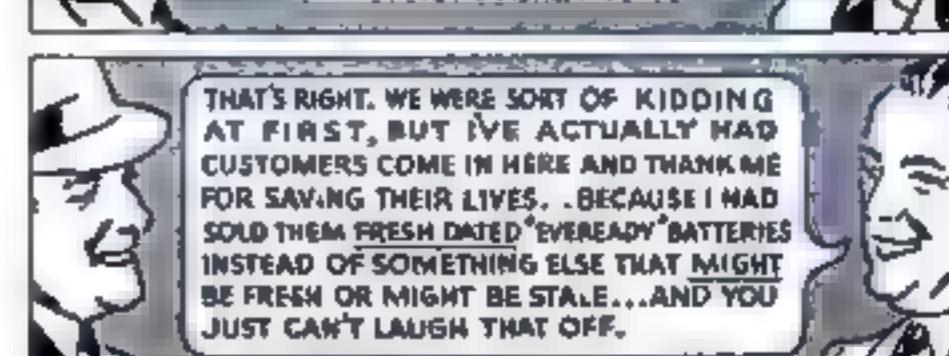
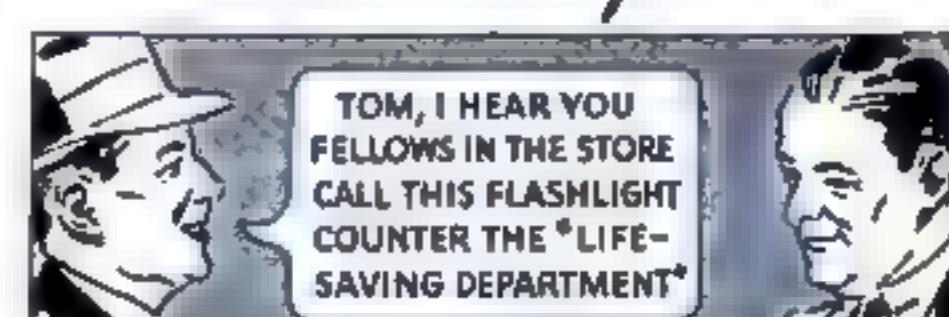
"We put the end of a long hay rope in the dog's mouth and told him to take it out there. He cowered and whined and didn't want to go, but finally he did.



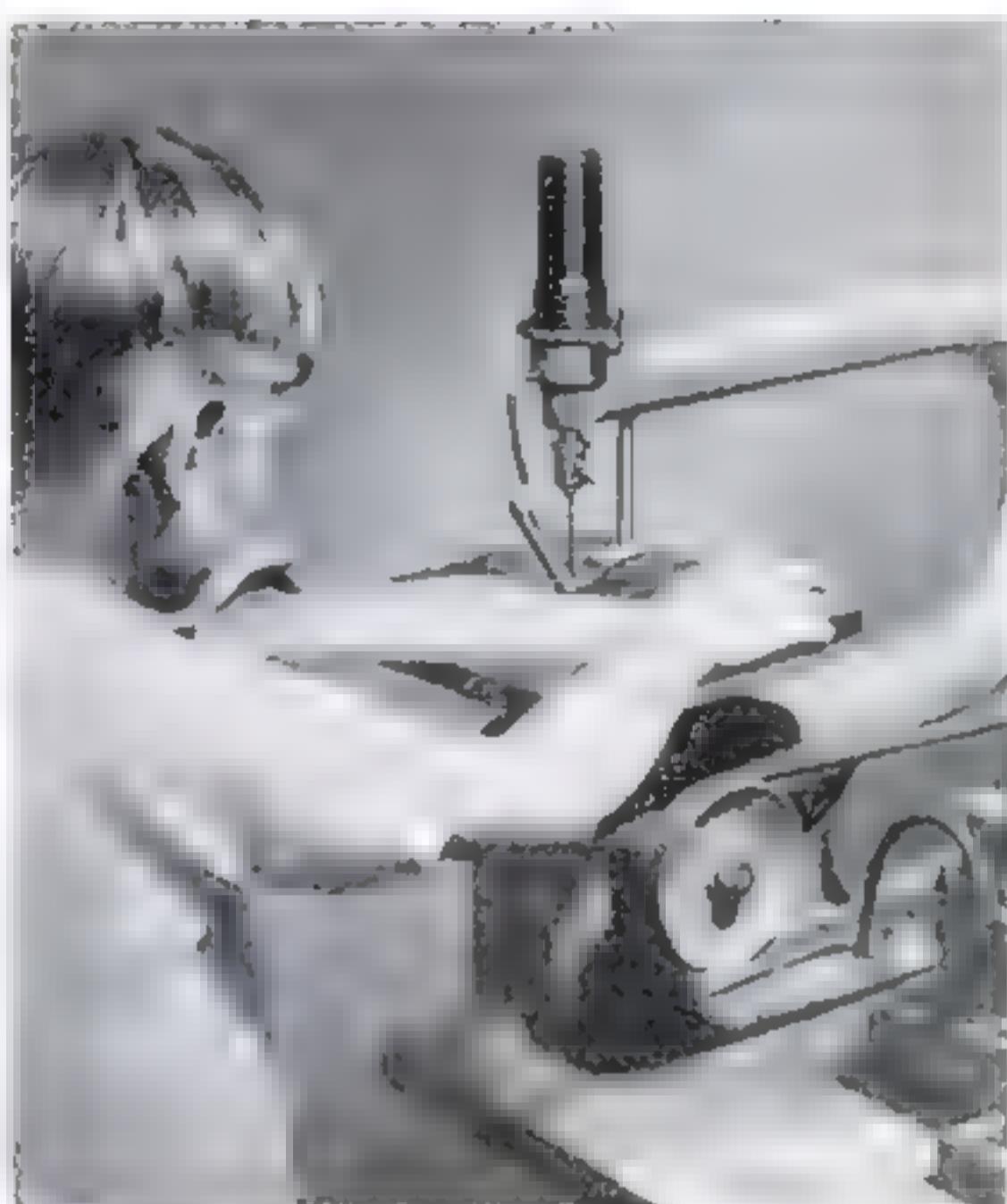
The man who had been signalling tied the rope around the one child in the group. She was crying with cold and fright, but finally started over the ice while we took in the slack of the rope, and got to shore safely. Then three times more Rex took the rope back. Each of the three grown-ups broke through the ice time and again...but thanks to the rope and good luck we were able to get them to dry land.

"The father performed a remarkable rescue in getting the car door open after that plunge to the bottom, getting the three others out and pulling them onto the roof. But he says they owe their lives to us and to the power of fresh DATED 'Eveready' batteries, for there they would have stayed and frozen if the batteries in that soaking wet light had failed to work.

Signed *Mr. W. J. Murtha*



# Safety Shoe and Guard for Jig-Saw Blades

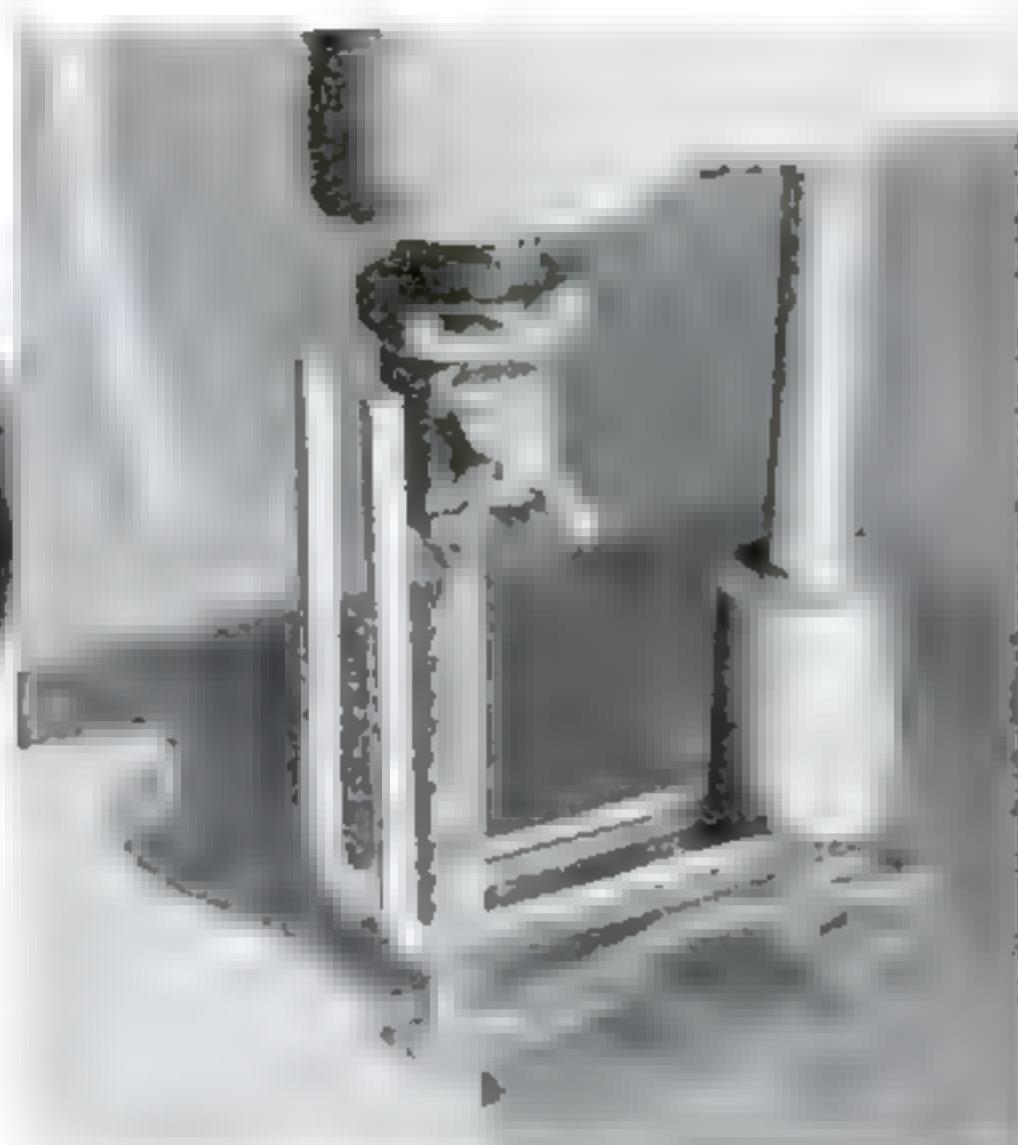


Jig saw protected so a child cannot cut his fingers

WHEN junior members of the family use a motor-driven jig saw—and no machine is better adapted for their use—it should be well guarded to prevent harm to small fingers. An eight-year-old boy can use a jig saw safely if it is provided with the accessories illustrated.

A shoe shaped like that on a sewing machine has the advantage of holding

A shoe with two projecting arms is added to the regular hold-down



Another type of guard for the blade is bent from wire and soldered to a sliding sleeve

down the work before it reaches the blade. This makes it easier to use large blades and prevents the work from jiggling excessively when being started by little hands devoid of strength. The shoe is a slotted piece of brass shaped as shown and soldered to the base of the hold-down provided with the jig saw.

The blade can be guarded in several

ways, but the simplest is to solder two vertical strips to the shoe. Another type of guard can be made from a piece of stiff brass or steel wire shaped into a "U" and soldered to a sleeve that slides up and down on the hold-down column. The wires can be bent upwards so that the fingers cannot come into contact with the blade.—W. WALDEMAR.



## Smoothing Toy Wheels and Other Disks

IN REFINISHING wheels of the disk type such as are found on children's toys, the job of sanding and smoothing can be simplified by holding the wheel against a moving pulley as shown. Use sandpaper or steel wool in the same way as if smoothing work in the lathe. This idea may be applied to any similar sanding jobs if the work has a center hole for a shaft. A felt or rubber-faced pulley could be made as a regular lathe accessory for such operations on polished or finished work.—NEIL NELSON.

## Turtle Shells Used for Novel Craftwork

SHELLS of the ordinary land turtle or tortoise can be made into many novelties. One illustration shows a wall vase or pocket for holding artificial flowers, grasses, or other small articles. It was made by cutting a baseboard of thin wood to fit the back of a shell and fastening it in place with a few brads through tiny holes drilled through the shell. Decorated a dark blue with the natural markings of the shell outlined in gold paint, it is much more attractive than can be judged from the black-and-white photograph at the right.

Of similar construction is the small twine holder shown in the second photograph. In this case, a small hole has been made in the center of the back, through which the twine is brought. Black and silver are the colors, but other combinations might be used.

Other possibilities are ash trays, pincushions, book ends, covers for boxes, and even desk lamps.—PAUL HADLEY.



This unusual hanging pocket or vase is a tortoise shell painted dark blue and gold

Twine holder constructed in a similar way and finished in black and silver

# Photo Portraits

... EIGHT WAYS TO LIGHT THEM  
WITH SIMPLE EQUIPMENT AT HOME



**OUTDOOR LIGHT.**  
A contrasty effect with one undiffused light high over sitter and a little in front and to one side. A reflector is used as in the drawing at right above



**SHADOW LIGHT.**  
A card with a 3-in. diameter hole may be held in front of the reflector on main light. Keep the side light off background



**SIDE AND BACK LIGHT.**  
In the right-hand portrait, light, grazing from behind, lightens hair, outlines back of head, and reveals texture. The front light is diffused



KEY: C. camera; R. reflector; L. lamp; D.S., diffusing screen; C.B., cardboard; L.BG., light, and D.BG., dark background

**LOW LIGHT.** Directly above, both lights play on sitter from below, and the camera shoots upward from a low angle. For dramatic effects



**IN SUBDUE KEY.**  
Used chiefly for quiet character studies. The light must be diffused. For softness develop film less than normal



**HIGH KEY.** The white background is illuminated from light behind sitter. Front light as near camera as possible. High side light



**NORMAL LIGHTING.**  
One lamp is used about 45 deg. above, to the side, and in front of sitter. A reflector relieves shadow side



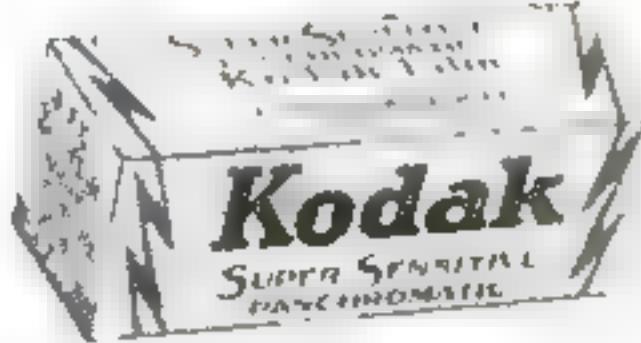
**EFFECT LIGHTING.**  
A 60-watt bulb is held in the hands, and side shadows are slightly illuminated by a diffused photoflood lamp

*You're making pictures in a  
new world — when it's*

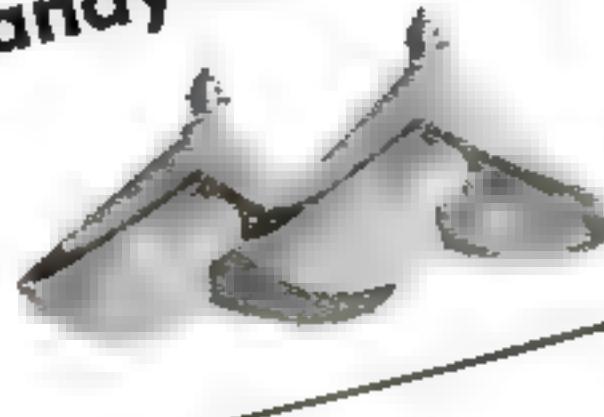
# SNAPSHOTS at NIGHT



**ALL YOU NEED—**  
Your present camera  
loaded with Kodak  
"SS" Film



Two or three  
Photoflood lamps  
in Kodak  
Handy Reflectors



INDOORS, at night, there's a new and fascinating world in which to ride your favorite hobby. Exciting picture chances all over the house and an interesting technique to learn—gauging distances, placing subjects, arranging lights. You get good pictures, too, from the very start; snapshots at night aren't at all difficult—they're just interestingly different.

Equipment is simple, inexpen-

sive. You don't need a high-priced camera—not any more. Any camera that takes Kodak "SS" Film does the trick—even a Brownie.

With "SS" Film, you use two or three of the new No. 2 Mazda Photoflood lamps, which last for hours, and inexpensive Kodak Handy Reflectors. If your camera is equipped with an f.6.3 or faster lens, then No. 1 Photofloods are powerful enough.

**FREE BOOKLET . . .** Suggests a variety of picture opportunities . . . shows you how to arrange your lights . . . how to place your subject . . . tells you everything you need to know about two ways to make night pictures—snapshots with Photoflood lamps, fast exposures with Photoflash lamps. (You can use Photoflash lamps, each good for one picture, if your particular camera can be set for "time.") The directions are simple and easy to understand. Be sure to get a free copy at your dealer's today . . . Eastman Kodak Company, Rochester, N. Y.

"VERY LITTLE MONEY...  
VERY PLEASANT WORK...  
**PRESTO—**  
**HELEN'S CORNER**  
**WARDROBE!"**

"There aren't many closets in our house, and Helen certainly needed more room for clothes. Then one day I read a MASONITE ad, sent for free plans and specifications, and look at the wardrobe I made Helen!"



Copyright 1938, Masonite Corporation

"At last the extra space we've always needed! Shelves for hats and shoes, rods for coats and dresses. Our new wardrobe makes the whole house seem larger... the whole bedroom brighter. Built of MASONITE TEMPERED PRESWOOD, studded with knobs and stars of brass, it gives our bedroom 'that well-furnished appearance.'"

You, too, can have that "extra closet." A MASONITE corner wardrobe is easy to build, a joy to own—and inexpensive. Mail the coupon for samples of MASONITE TEMPERED PRESWOOD and plans and specifications for the MASONITE corner wardrobe—they're free!



**MASONITE**

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# Blueprints for Building Ship Models

Designed by  
Capt. E. A. McCann

BLUEPRINTS for a wide variety of models designed for POPULAR SCIENCE MONTHLY by the late Capt. E. Armitage McCann may be obtained from our Blueprint Service Department. If you enjoy making ship models, or if you would like to start this fascinating hobby, you will find Captain McCann's plans of invaluable assistance.

For the convenience of readers we have prepared construction kits for models marked with an asterisk (\*). A description will be found on page 28.

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In addition to the models by Captain McCann, we have blueprints for other models, furniture, boats, radio sets, toys, and novelties. A complete list will be sent upon receipt of a stamped, self-addressed envelope.

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You can construct the Elizabethan galleon 'Revenge' from Blueprints 206-207-208-209

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## Metal Photo Holders



WHEN you wish your favorite snapshots to be on display instead of hidden away in an album, simple and inexpensive holders may be made as shown. They enable the pictures to be changed in an instant. Nickel-plated sheet zinc was the metal used for the holders illustrated, the dull side being buffed so that both sides would have a high polish. The prints are held between two sheets of glass, the easels being bent to hold them securely—E. V. B.

### Putty, the Heat Saver

(Continued from page 90)

glazing as soon as they were secured at each end by 3-in. No. 10 flathead, cadmium-plated or galvanized screws.

One illustration shows the method of packing the putty into the rabbet with a thick glazing knife. Without this pressure, the putty will tend to pull out when the putty bevel is cut with a steady down stroke while the back face of the blade rests against the wood. The excess putty on the glass is quickly removed by using a small ball of putty to catch the waste portion at the top and giving a quick downward sweep to clean off the whole strip.

To leave a neat corner where two lines of putty meet, use the face of the knife at the correct angle to smooth out the exposed bevel while stroking away from the corner. The correct angle for the putty is secured when the edge of the base of the putty bevel is parallel with the inside face of the sash.

In greenhouse work it pays to back-putty the roof glass on the inside to prevent any possible roof leaks along the sash bars.

For spot-putty work on flat surfaces, the putty should be pressed in hard with the thumb and then cut off flush with the face of the work by using a flexible putty knife as shown. A quick cross stroke with the heel of the hand will then smooth and seal the edges.

No putty work can hope to survive wind, rain, sun heat, and cold if left unprotected. It should be allowed to dry hard and then be given two coats of paint. Allow the undercoat to dry hard before applying the finish coat.

One of the neatest paint jobs I have checked over in many years was a Colonial home painted silver-gray body with ivory trim and sash. The putty bevel only was cut in black. This gave a beautiful effect, but still retained the dignity of Colonial architecture.

..that swell  
Velvet aroma  
tells the  
story

—the MILDNESS  
of fine old  
Kentucky Burley  
aged in wood

—the FLAVOR  
of pure maple  
sugar for extra  
good taste

Velvet packs easy in a pipe  
Rolls smooth in a cigarette  
Draws right in both

6 CIGS  
smoking  
tobacco

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# Treet Topics

WHEN SHE SAYS



AND YOU SAY



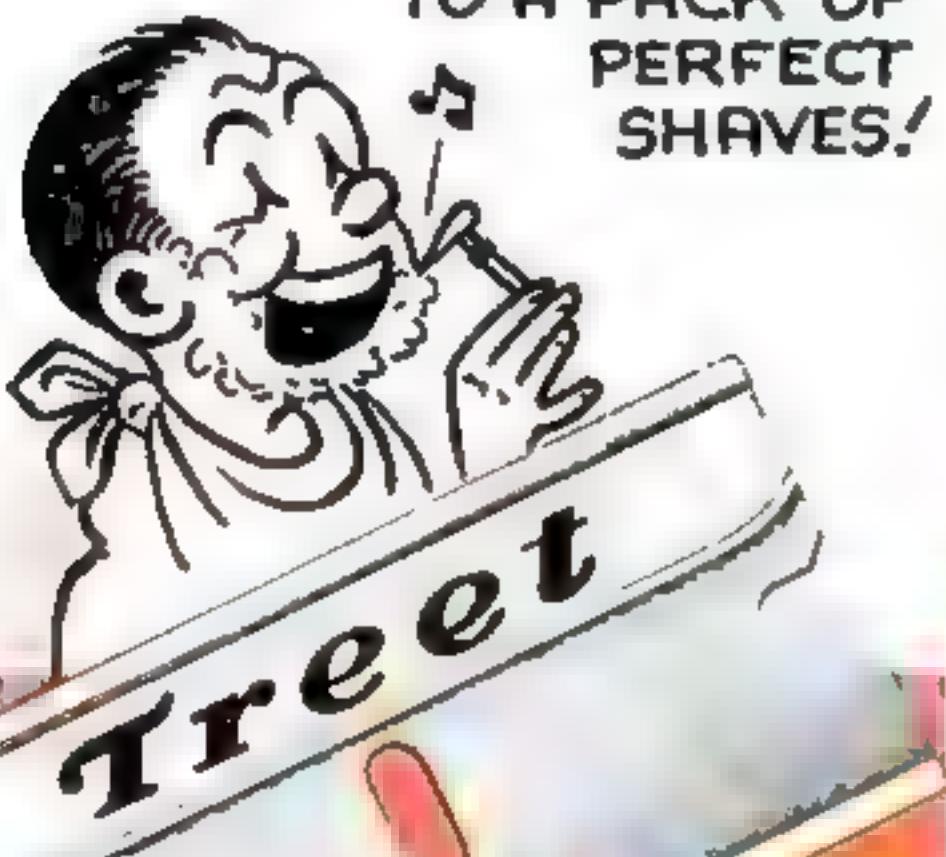
AND  
YOUR  
BANK  
ROLL  
SAYS



SAY



-AND TREET YOURSELF  
TO A PACK OF  
PERFECT  
SHAVES!



Treet Safety Razor Corporation, Newark, New Jersey

## How to Make Your Skis Last Longer

(Continued from page 81)

can be used as a substitute. Be careful not to damage the wood. Then rub each ski with gasoline or benzine to remove wax from the pores. As a final step, sand with very fine sandpaper to make the surface as smooth as possible.

Spread the tar evenly over the whole surface and burn in with a blowtorch, but take care not to char the wood. Wipe off the excess tar with a rag and rub pure, hard wax into the skis while they are still hot. This forms an excellent base for the soft waxes. It can be highly polished with a cork.

A simpler method of waterproofing is to use a special quick-drying ski lacquer. First clean the skis as explained above and then apply the lacquer with a piece of soft cloth instead of a brush. At least three coats are needed for a good finish. Rub the first and second coats down with fine steel wool or sandpaper. The lacquer is highly inflammable so be careful not to get a lighted blowtorch or any open flame near it.

The proper waterproofing of the running surface is very important because it not only preserves the wood from absorbing excess moisture, but also furnishes a bond between the skis and the wax. There are many varieties of waxes for all kinds of weather and snow conditions, and some of them do not stick well to the wood. For the uninitiated, I might explain at this point that skiers use the same wax for climbing the hill as for running down. In one instance the wax holds the skier from slipping backwards; in the other case, the same wax makes the skis slippery. This may sound paradoxical, but the reason is that when climbing, the skis are lifted and tiny crystals form on the wax and grip the snow; when gliding, the resulting friction melts the snow, and the wax acts as a lubricant.

Running and climbing waxes should be applied on the day of skiing because the temperature and weather conditions will determine which wax to use. There are four main divisions: downhill wax, universal wax for cold and dry weather, universal wax for warm weather, and klister wax for very wet snow.

With the increase of speed in skiing in recent years, there came the necessity for exact control of skis. While the straight-running downhill requires strength and steadiness, the turns are the snags where most falls occur. Especially in Eastern United States where the skiing is done on wooded trails and the turns are compulsory and not voluntary, the question of correct placing and timing of turns is an absolute necessity. "A turn missed—a tree kissed" sounds amusing, but it doesn't feel that way!

WHEN skis have been used for some time, the edges become too worn to cut icy snow. The problem of preventing this wear and attaining greater control is solved by attaching artificial edges to the skis. It took a long time to test out different materials, but now it is generally conceded that flat, cold-



Quick-drying ski lacquer rubbed on with a soft cloth will waterproof the undersurface

rolled steel edges are the best for local skiing. I use strips of steel  $1/32$  in. thick by  $5/16$  in. wide and between 8 and 10 in. long, scarfed and drilled as shown in the drawing. They can be purchased in ski shops, or you can make your own. Dimensions can vary somewhat, but it would be best not to have the strip any wider. The edges are attached with  $\frac{1}{8}$ -in. No. 2 flathead iron screws. The reason for the beveled ends is that one edge fits over the next and no snow can get between.

To apply these edges, use a rabbet plane or a router to rabbet out the wood, starting about 20 in. from the tip and ending 4 in. from the back. Compute the exact length first so you will not have to cut odd lengths of edges to fit. Cut the rabbet so that the edges will fit  $1/64$  in. below the running surface of the ski and flush with the side. This rabbet can be cut by hand with a chisel, but it is a long and tedious process and extreme care must be exercised. Drill  $1/32$ -in. holes in the skis and fill with linseed oil before screwing the edges in place.

With the more expensive skis it pays to protect the leading edge above the steel edge. Some racers use the metal edge to within 4 in. of the tip, but this makes the ski stiff, and the metal has a tendency to catch on crust and twigs. Instead of steel, thin strips of celluloid, or of synthetic resin impregnated with linen, are sometimes used. The resin strips are  $1/32$  in. thick and  $\frac{1}{8}$  in. wide, but are comparatively expensive and extremely difficult to obtain. They are held to the wood with waterproof casein glue. For celluloid, it is necessary to use a cellulose-acetate cement, but the latter does not always hold well so the result is not entirely satisfactory.

In Central Europe, where the snow is deeper and softer, one-piece brass edges have been developed, and the idea has been tried here. While excellent for easy skiing, brass edges stiffen the skis perceptibly, which is a disadvantage where rough, hard terrain is encountered; and if broken, they are not easily repaired.

Next month Mr. Andre will tell how to repair split skis, replace a broken tip, straighten a twisted ski, and construct a ski press.

## Moon-and-Owl Sconce of Three Metals

(Continued from page 89)

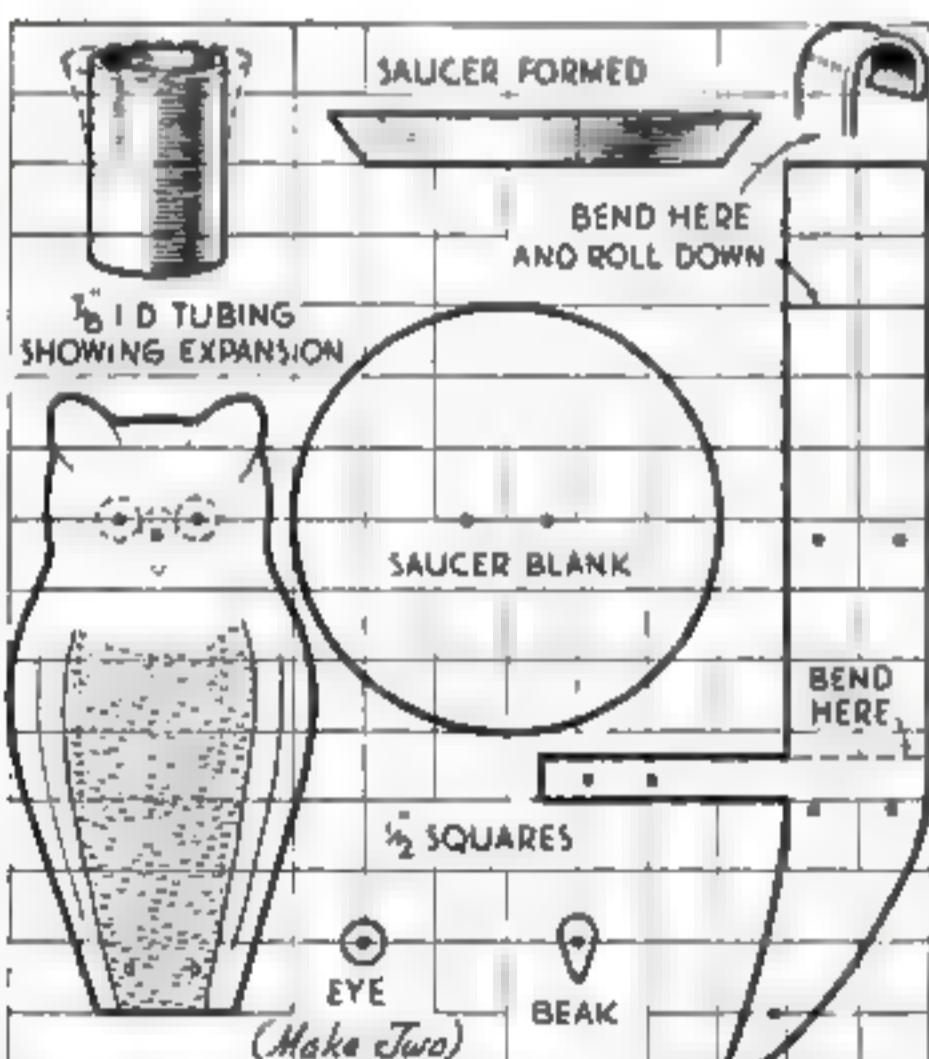
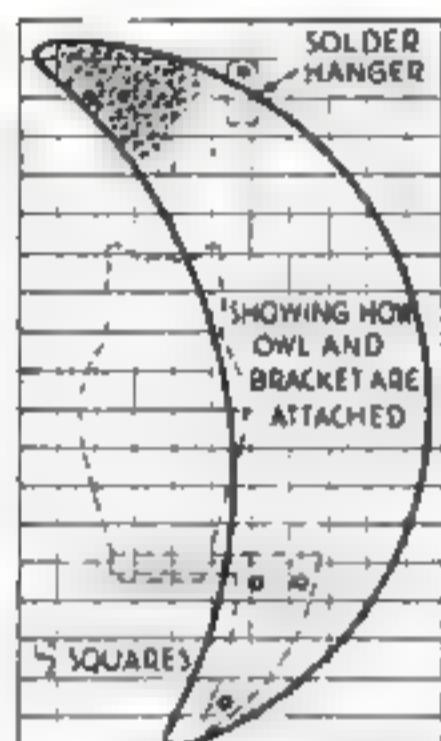


Flaring end of the candle-cup tubing

The eyes may be made of any white metal; in the model shown they were made from chrome-plated brass. The beak is made of yellow brass.

All the copper pieces should be colored. Dissolve a small piece of liver of sulphur in a little water, immerse the pieces in this, and leave until dark; then remove, dry, and buff. Paint the owl with a thin coat of dead black paint and let dry, and rub highlights with emery paper.

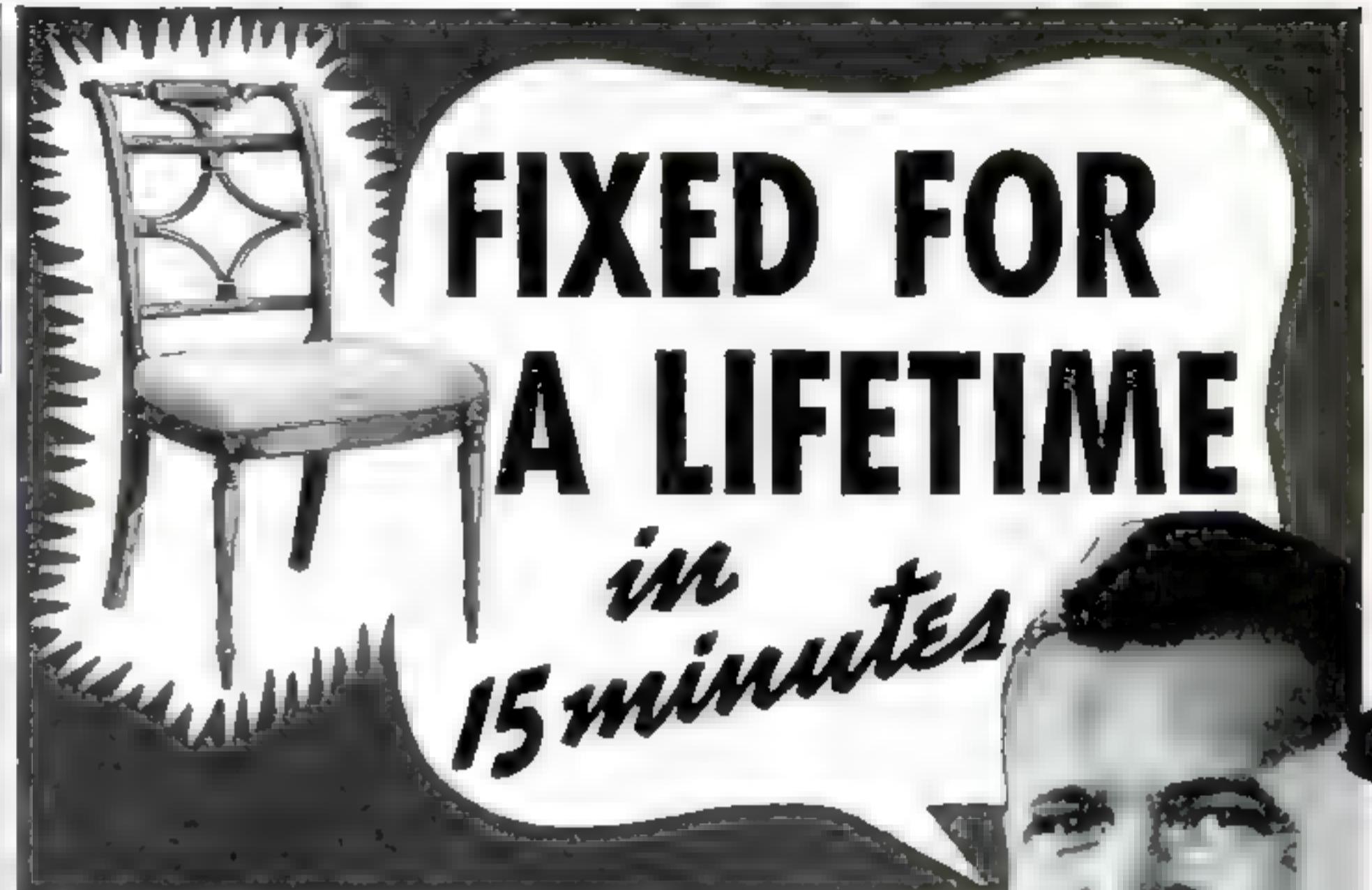
Assemble the pieces as shown with No. 12 brass escutcheon pins, and solder the candle cup in the saucer. Attach a hanger to the top for hanging up. Buff or polish the entire piece, and protect the finished surfaces with lacquer.—DICK HUTCHINSON.



Owl, saucer blank, bracket, and other details

### Safety Pin Keeps Long Roll Film Uncurled While Being Washed

ROLL film has a tendency to curl up while being washed after development so that the water is prevented from freely reaching all parts of the film. One way to prevent this is to double the film, face out, and fasten the ends with a safety pin.—ROBERT GUSTAVSON.



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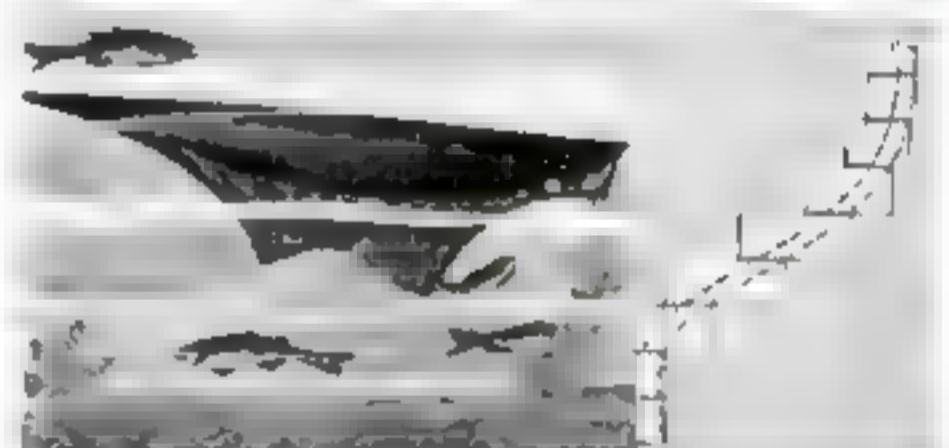
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## Monkeys Aid War on Infantile Paralysis

(Continued from page 57)

from the pituitary glands of sheep and rats into immature monkeys of an age corresponding to the period when children are susceptible to polio, not only made the monkeys too old for their age, but also found a promising link between susceptibility to infantile paralysis and lack of certain hormones. These "older" monkeys, instead of dying, as had others previously inoculated with the hormone extract, resisted the disease or developed only a passing attack.

THESE experiments indicated to the scientists a possible reason, but did not prove, why adults seldom contract the disease, while children are far more susceptible.

But experimenters elsewhere doubted that serums and vaccines could reach the trouble, and from Stanford came the reason why. There Dr. Schultz investigated and found the virus travels to the brain in or along the olfactory nerve and olfactory tracts; others showed that it also travels from one level of the nervous system to another within the nerve cells. This seemed to render serums and vaccines impotent, since both of these preventives must be carried by the blood.

In special quarters at Stanford and elsewhere, you would find many monkeys awaiting their turns at experimentation. At Stanford, for instance, the monkeys are first housed in outdoor cages. Periodically, a group is numbered and treated with zinc. Thirty and sixty days later, virus is instilled into their noses. Before every treatment, each is placed in a small metal container and anesthetized.

Most of these monkeys escape infection, yet occasionally one succumbs to the disease. Immediately, deft-fingered laboratory workers take sections of the spinal cord, store them in glycerine in a refrigerator, where the deadly virus remains active and available for study for many years. Later these sections are ground in a mortar, the tiny pieces suspended in a salt solution, and filtered through porous materials through which the smallest bacteria cannot pass. With this virus, other monkeys are infected for further experiments.

DR. SCHULTZ considered the possibility of trying to deliver a ready-made immunity in the form of serums, or building up an immunity in monkeys by serums. Fourteen experiments were carried out in the Stanford laboratories, with chattering simians recently brought from India as the living test tubes. Briefly, of ninety-one inoculated with a serum, only twenty-eight escaped infection after the deadly germs had been delivered into their bodies. Not a sufficient guarantee for the health of children.

Later, Dr. Schultz tried to build up an immunity to the disease in other mon-

keys, using various vaccine formulas, and again the subjects succumbed when inoculated with the virus.

Meanwhile, laboratory investigations led to the conclusion that the virus thrives only within the nerve cells, and enters only through the nose. Although disheartened by the failure of serums and vaccines to produce immunity, from these "negative results" Dr. Armstrong on one side of the continent and Dr. Schultz on the other undertook another drive on the enemy—with chemical blockades.

IN WASHINGTON and at Stanford, solutions of alum were run into the noses of monkeys. Following spraying, the death-carrying virus was delivered to the delicate hair-endings of the nerves by atomizers. And the chemicals blocked the virus out, saved the monkeys!

Soon came confirmation from Dr. Albert S. Sabin, Dr. Peter K. Olitsky, and Dr. Herald R. Cox at the Rockefeller Institute. They found that tannic acid also exercised a preventive action. Other agents, including picric acid, were successfully tested.

Tests on human beings, except for those in the South two years ago with picric acid and alum, and a few scattered cases last year, remain to be made. In Dr. Peet's nasal spray, Dr. Schultz's zinc sulphate, and application in the field under supervision of trained workers, the polio fighters now place their hopes.

This spray modifies the tissues, thereby blocking the virus. Now, although the drug pontocaine allays discomfort somewhat, attempts are being made to avoid irritating the delicate membranes, particularly important when treating children.

Dr. Sidney S. Kramer recently developed at the Long Island Medical College a solution of adrephrine and pituitrin. Adrephrine is a combination of ephedrine, used in treatment of colds, and adrenalin, which relieves asthma. He also includes a harmless solution of a hormone extract, pituitrin S, which prolongs the adrephrine action. This spray, he has found, causes a mobilization of certain white blood cells immediately under the mucous membrane and around the nerve endings. Again, on monkeys the new treatment is effective. For humans? Only time and experiment will reveal the answer to this question.

THUS, step by step, science advances in the war on dreaded infantile paralysis. With the fundamental problems recognized, experimenters believe that it is only a matter of time until a practical preventive treatment, applicable by field workers with reasonable assurance of success, will be developed. And when that long-sought goal has been reached, no small part of the credit will be due to the patient little animals that made the tests possible.



Fig. 7. Low-speed grinder cuts boiler tube

## Cut-off Wheels Slice Steel Like Cheese

(Continued from page 97)

regularly stocked, and others 6 by 1/64 in. are frequently used.

When I said that cut-off wheels were not restricted to machine shops, I meant just that. Figures 4 and 6 speak for themselves. In Fig. 6 a cut-off wheel is used with table equipment to cut molded plastic. The surface speed recommended in this case is from 8,000 to 9,000 s.f.p.m. Builders and carpenters, roofers, and side-wall applicators can make good use of this set-up.

In Fig. 4 tile is being cut. Parallel cuts are obtained by means of a special fixture, made to suit individual requirements. Note that this unit is a replica of the modern electrical handsaw, and like a portable electric drill, it can be set up on a workbench in various ways to cut light stock. This size is suitable for tile and imitation stone workers and uses a 6- or 7-in. wheel at 2,500 r.p.m.

As related to the home workshop and service garage, the cut-off wheel obviously brings the bench electrical grinder into play. The equipment must necessarily be in very good shape. Cut-off wheels are strong radially but weak axially, so end play is entirely out of the picture. The maximum width of  $\frac{1}{8}$  in. should be given the preference, and the diameter depends on the speed of the motor and the rigidity of the shaft. Practical recommendations:

Diameter of Shaft	R.P.M.	Type of Bearings	Maximum Diameter of Wheel to Use
$\frac{1}{2}$ in.	1,800	Bronze	8 in.
$\frac{1}{2}$ "	3,600	Ball	7 "
$\frac{5}{8}$ "	1,800	Bronze	9 "
$\frac{5}{8}$ "	3,600	Ball	8 "
$\frac{3}{4}$ "	1,800	Bronze	10 "
$\frac{3}{4}$ "	3,600	Ball	9 "

In all cases, cut-off wheels must be mounted between collars to strengthen them. The collars should be made of stock from 3/32 to  $\frac{1}{8}$  in. thick and their diameters should be at least one third and preferably one half that of the wheel. The work should always be cut resting on the table, and the work movement must be positive.



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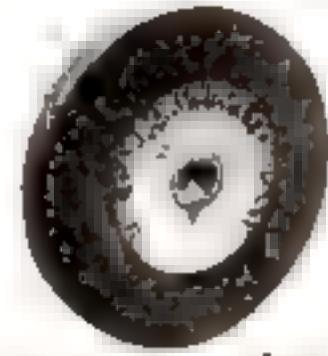
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## Straight-Shooting Cops

(Continued from page 63)

James E. Davis, one of the nation's best-known pistol shots, became chief, his first act was to make compulsory the firing of not less than forty rounds by every officer on the force every month. Davis inaugurated a system of bonuses to all qualifying as "marksman," "sharpshooter," and "expert." Recently he has added a new classification known as "distinguished expert," which requires a score of 385 out of a possible 400.

SO DIFFICULT is the "distinguished expert" medal to win, that, while fourteen of his officers have won "distinguished pistol shot" medals awarded by the U.S. War Department, only nine have qualified for the local rating.

By rewarding the officers with additional pay and convincing them that in expert shooting lay their own safety when meeting bank robbers, burglars, and escaping criminals, Davis has developed more world-famous marksmen than any other department in the country can boast—men who can bring in twelve dead criminals for every officer lost in a gun battle.

"Isn't that still a high percentage of losses?" I asked Davis the other day, raising my voice to be heard above the rattle of intermittent firing on the range.

"Not when you consider the natural advantage a bandit enjoys," he answered. "Remember, officers must proceed cautiously because of the risk of taking the lives of innocent people."

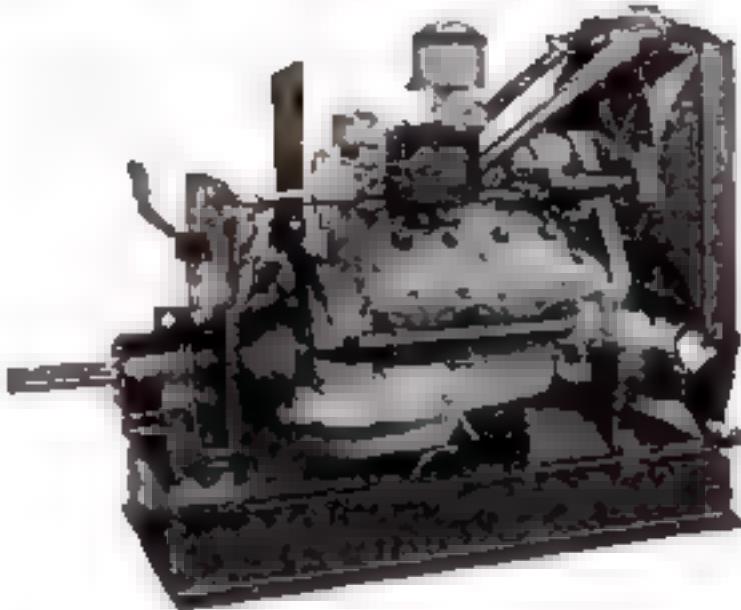
It is on the range where I talked with Davis, and in the near-by fields, that he trains his officers to think faster and shoot first when necessary. At the time of my visit, fifty-eight young men were divided into five groups, one practicing on standard targets, another tossing medicine balls, a third hiking over nearby hills, the fourth learning to scale high walls, and yet another advancing in turn down "Hogan's Alley," learning to put bullets into heads appearing unexpectedly in tiny windows.

LET'S see how Davis turns green youngsters, most of whom never fired a pistol before, into formidable offensive and defensive experts. Military drill and calisthenics on broad, grassy fields build them up gradually. Wall-scaling helps bring out their physical condition. Hikes—that's what Instructor John Dillon calls them—take them at first on a 2½-mile jaunt down canyons, up hills, over cliffs. I tried one to see precisely what he meant. We covered four miles that morning, and Dillon explained that the boys would be covering nine miles daily before they came up for graduation and the diplomas which formally make them eligible for duty with the force.

On the training ground that afternoon, Dillon demonstrated with a dozen rookies how to disarm a thug, even when he is holding a gun against your

(Continued on page 121)

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Between the ages of 13 and 25, vital glands are developing, helping you gain full manhood or womanhood. These gland changes upset the system. Poisons are thrown into your blood . . . and blouse out of your skin in hated pimples.

Resolve to rid your skin of these adolescent pimples. Thousands have succeeded by eating Fleischmann's Yeast, three cakes a day. Each cake is made up of millions of tiny, active, living yeast plants that fight pimple-making poisons at their source in the intestines and help heal your skin, making it smooth and attractive. Many get amazing results in 30 days or less. Start eating Fleischmann's Yeast today!

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## Straight-Shooting Cops

(Continued from page 120)

chest or prodding it into your back.

"You are safer than anybody else in the vicinity, including the thug," the instructor explained, "provided you go after the gun immediately."

Dillon selected Earl M. Farrant, who later graduated with top pistol-shooting honors, to act the part of a crook while he demonstrated in slow motion how to take a loaded gun or a knife from an attacker. I pass the instructions along, in his own words, for they'll work anywhere, any time:

"**W**HEN a gun is stuck in your ribs, drop your left hand, grasping the gun or hand. Strike the gun to the right side and pivot on your feet toward the right, thus throwing yourself out of the line of fire. Grasp the gun and hand with both your hands, turning the weapon toward the left, muzzle pointing toward the attacker. Bend his hand at the wrist, which breaks the grip, and remove the pistol with your right hand. A little more pressure on the wrist will throw him, and you will have his gun.

"If you feel a gun muzzle against your back, turn swiftly on the ball of your right foot, drop your right arm down and back. In one movement, the forearm will strike the gun and knock it away, usually out of the hand entirely. Having struck the gun aside, proceed to grasp the hand as in a frontal attack. That's all."

It was on the shooting ranges that I witnessed the real development of straight-shooting officers. From the first day in school, every man fires sixty shots, slow and rapid, at fixed, silhouette, and disappearing targets, during the day and with lights out at night.

Suppose we move with the class to the defense range. Here we found five silhouettes made of metal, each representing the torso of a man. Capt. Ross R. McDonald, who commands the training division, explained what the men must accomplish before they qualify as full-fledged officers:

"These targets represent criminal attackers, and you must hit all five with five shots while retreating, advancing, and firing from barricades, with both hands. Stand sideways to present a smaller target, extend the firing arm, and hold your thumb along the hammer toward the cylinder. Move slowly at first, but make every shot strike home."

**O**N SIGNAL, the embryo marksmen turned while walking away, took guns from holsters, fired while advancing at short range on the imaginary enemy. One by one they advanced to the attack, and from each the ping of soft steel striking the metal silhouettes reached my ears, as I stood in safety fifty feet away.

I marveled at the speed and skill they displayed, after only two weeks in class; yet their feats here seemed only child's play when we moved later to the nearby offense corner. This is the "Hogan's

(Continued on page 122)

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Close-up of the old style tooth construction.

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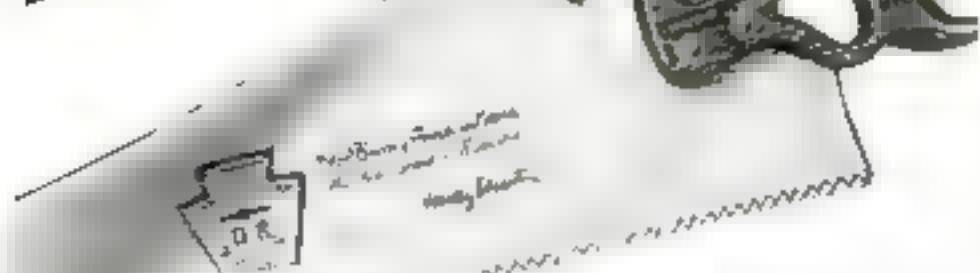
6" (1/4" hole), \$2.70 8" (1/4", 1/8", 3/4" hole), \$3.50  
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## Straight-Shooting Cops

(Continued from page 121)

"Alley" where they learn to pick off attackers who shoot from behind corners and from windows.

Robert M. Calhoun, another star shot, took his position at the end of the alley. In the control pit Sergt. Jack Guyot fingered a series of levers controlling the disappearing heads. As a whistle blew, Calhoun advanced at a walk, loading his empty gun. A head appeared in a second-story window. Calhoun fired one shot, dropped to his knee, fired two shots holding the gun with both hands, took cover behind a tree, fired once with each hand. All this from commencement of loading to final shot in twenty-five seconds, or less!

**A**GAIN he came through, now at a trot. With his gun loaded, he hesitated when a head appeared on the left. Firing one shot, he leaped behind a lamp post, and fired again with each hand. Advancing, from cover of a tree he placed two more shots, one from each hand, in the paper head. This in thirty seconds.

Once more, Calhoun entered the alley, this time riding in an automobile. When a target appeared, he fired once while advancing, two while abreast, and two to the rear after he had passed.

Straight shooting? Chief Davis requires all rookies to score 300 in a possible 400 in Hogan's Alley. The boys I saw moving swiftly toward expert marksmanship averaged 376!

But firing at metal silhouettes and disappearing heads forms only a part of their rigorous training. Afternoon shadows fall, night descends, and they find themselves on yet another range. Each man pumps five shots into a silhouette as lights from the pits below bathe the battery of targets in a peculiar brilliance. That's for practice. Now he sends thirty-five bullets into his target with lights off in the pits, lights off on the firing line, darkness on both firing line and target. Drawing, loading, firing, and reloading, he places ten shots in forty-five seconds.

**T**HREE years ago, Chief Davis decided that nothing must stand in the way of all his officers practicing shooting whenever they found time to visit the range. Accordingly, he arranged for ammunition, as it was used, to be reloaded and used again. Today, in the "bullet room" at the Lincoln Heights jail, a dozen prisoners decap used cartridge cases; recap, mold, size, and lubricate newly poured bullets; reprime empty cases, and turn out 5,000 cartridges every day at a cost of only one cent each.

It was with this homemade ammunition that twenty-two picked men under command of Lieut. J. O. Dircks practiced before journeying recently to Camp Perry, Ohio. In addition to the five team victories, Lieut. E. E. Jones won five individual matches, the greatest number ever achieved by a single shooter during the national meet.

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## Neck-Strap "Tripod" for Small Camera

MINIATURE cameras or small moving picture cameras can be held steadily with the aid of the device illustrated. Saw off 20 in. from the rounded end of a broomstick and bore a  $\frac{1}{2}$ -in. hole through it about 1 in. from the rounded end. Flatten the sides of the opposite end for  $1\frac{1}{2}$  in. until the thickness is only  $\frac{1}{2}$  in. Any standard swivel camera support may be attached.

A dog lead will serve as a neck strap. It is passed through the hole in the lower end of the stick and adjusted with a buckle.—CLEMENT W. RICKMAN.

## Technique of Taking Photo Portraits

ALL the portraits on page 112 were taken with a 9 by 12-cm. camera on supersensitive panchromatic film. I tried to choose those lighting effects that would be of most use to the amateur with limited equipment. Only two backgrounds were used—a white sheet and a dark window shade.

The so-called "outdoor" light and the normal lighting, which gave the most straightforward and best likenesses of the lot, were each accomplished with a single photoflood bulb in a 95-cent reflector, the shadow side being softened with a cardboard reflector. In the more complicated lightings, I used two aluminum clamp-on reflectors, with a desk lamp pinch hitting for the third light.

For a diffusion screen, a disk of tracing cloth was glued to a ring of cardboard and clipped on the reflector.

The three effects noted as "outdoor," "high key," and "low light," were taken at F/4.5 with an exposure of 1/5 second. Those referred to as "subdued key," "normal lighting," and "side and back light" required the diffusing screen and were given  $\frac{1}{2}$  second at F/4.5. The portrait with a sharp shadow on the background was given 1 second at F/4.5 because a screen with a hole in it had to be placed over the main light. The cigarette-lighting shot took 1/10 second at F/6.3.—KENNETH M. SWEZEY.

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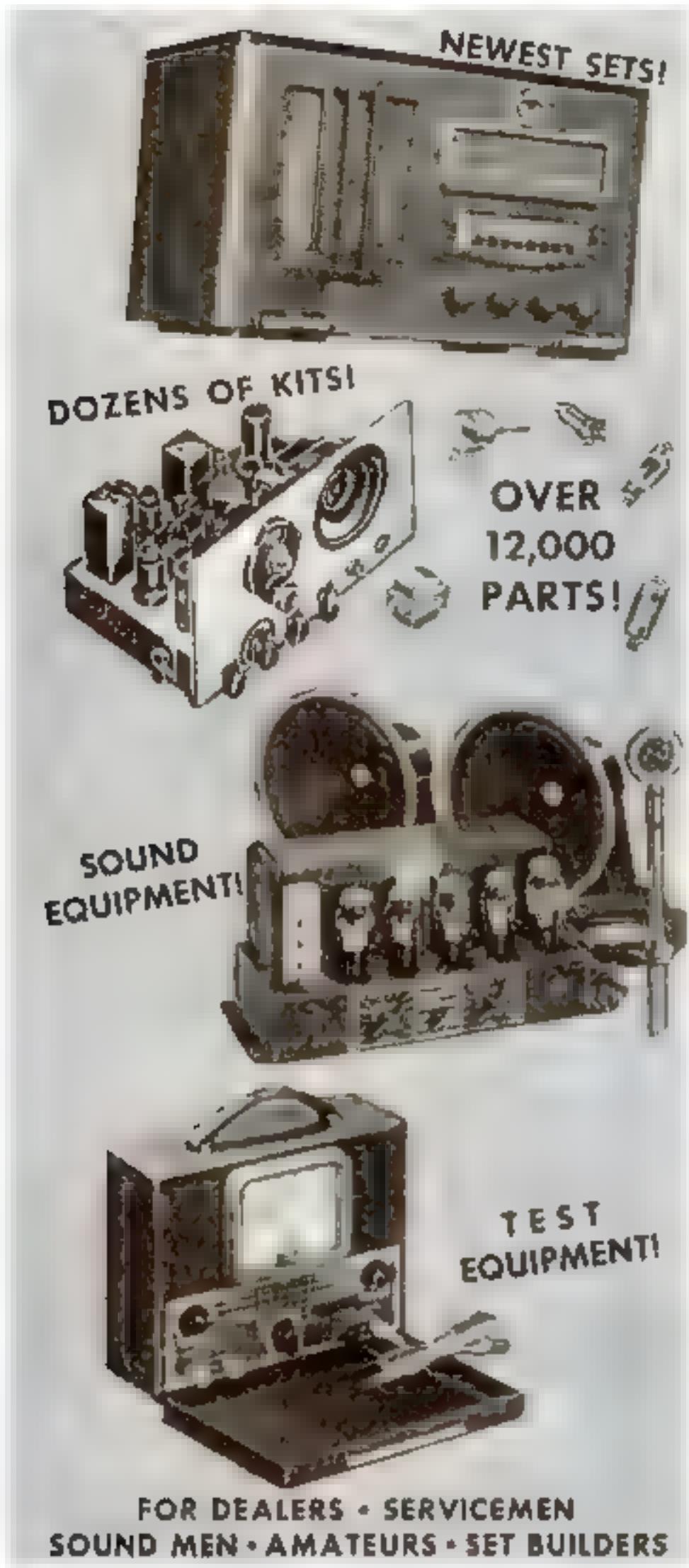
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Set-up used when prints are to be washed. A tumbler prevents clogging up the drain

pipe by sharpening one end and forcing the pipe through the rubber stopper.

When plugged into the bathtub outlet, the device will allow the water to rise to a height of 6 in. before draining. Although it is not required for films and plates, a glass tumbler with three wooden clips attached to its rim may be inverted over the drain to prevent prints from floating over and clogging the outlet. Roll films should be stretched out with a weighted clip on each end.

A great many prints, including extralarge bromide projection prints, can be thoroughly washed by this method. The water should be kept running through a length of rubber hose attached to the faucet.—LOUIS HOCHMAN.

## Tape Aids in Pulling Cork from Developer Bottle



A finger is slipped underneath the tape

CORKS in bottles containing photographic developer are often difficult to remove. To make the removal easy, wrap a short piece of adhesive tape around each cork lengthwise, twisting part of it into a roll to serve as a handle.—C.L.

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## Capt. E. A. McCann

(Continued from page 78)

McCann's earlier career at sea. Son of an Irish clergyman, he shipped at fourteen as an apprentice on the *Torrens*, the very ship on which Conrad was about to write his first book, "Almayer's Folly," and the last ship the novelist commanded.

When fifteen, Captain McCann built his first model. At nineteen he had worked his way up to master of the large iron bark *Umvati*, plying between islands of the Indian Sea. Struck by a storm of hurricane violence, the ship was driven ashore on the island of Mauritius, near Madagascar, and left stranded in a churchyard, a complete wreck with a tombstone driven into her hull.

During the Boer war, Captain McCann served in the Imperial Light Horse at Johannesburg and was wounded. He made a small fortune in South Africa, had adventures in many parts of the world, and lived for years in London, where he directed an international art association.

The sea called him back at the outbreak of the World War, and he did transport service from beginning to end. His ships were torpedoed, shelled, mined, and even air-raided at various times. Three ships were sunk under him, two with torpedoes and one by striking a floating mine in the North Sea.

After the war he went to sea only a few times, mainly on American ships. He held both British and American licenses as a master mariner. Life on big steamships, however, seemed tame and somewhat lonely, and he turned his attention to model making. His first great model was of the *Torrens*, which attracted the attention of Gordon Grant, the marine artist, and was purchased by Col. H. H. Rogers.

With very few exceptions, all Captain McCann's subsequent models were made especially for POPULAR SCIENCE MONTHLY, as follows:

1926—Barbary pirate galley or felucca; Spanish treasure galleon; clipper ship *Sovereign of the Seas*. 1927—Frigate *Constitution* ("Old Ironsides"); Viking war vessel; ship-model weather vane (the *Grand Turk*); *Santa Maria*. 1928—*Mayflower*; Baltimore clipper with sails carved from wood; stern-wheel Mississippi and Ohio River packet, the *Buckeye State*. 1929—Scenic half model of the iron bark *Umvati*; fishing schooner *Bluenose*.

1930—Clipper ship in a bottle; sampan model; U. S. destroyer *Preston* (327). 1931—Roman galley. 1932—Whaling ship *Wanderer*; U. S. battleship *Texas*. 1933—Elizabethan galleon *Revenge*. 1934—U. S. sloop-of-war *Hartford*, flagship of Admiral Farragut; *Swallow*, a privateer of 1812.

1935—Maine type three-masted trading schooner; the *Bounty*; a Mississippi River show boat; *Great Republic*, largest clipper ship built in the United States. 1936—Harbor tugboat; Coast Guard patrol boat; Barnegat lighthouse. 1937—Brig *Malek Adhel*; New Bedford whaleboat; the Confederate raider *Alabama*.

In 1928 Captain McCann founded the Ship Model Makers' Club, and in 1933 he became a member of the Advisory Council of the National Homeworkshop Guild.

On his last model, the *Alabama*, Captain McCann lavished many months of painstaking work. When it was completed to his satisfaction, he made arrangements with a photographer to take a set of pictures. He died the day before that appointment, so the Captain himself will not appear in any of the pictures of the new model.

Although he has laid down his tools, his hand will continue to guide ship model makers. For years to come, ship lovers the world over will be building from his plans and striving to reproduce in their little ships something of the dauntless spirit of the sea that he so ably embodied in every one of his masterly models.

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## Science Studies Nudism

(Continued from page 71)

of nudist "hardening" by exposing the body to sun and air and cold, the researchers show, can make it immune to the evil effects of shifting temperatures. Without the protection of clothing, the motionless human system is constitutionally unfitted to cope with cold. Only in lands where the temperature never drops below eighty-three degrees, can nudists live in comfort.

OTHER tests made at the Russell Sage laboratory reveal that our skins are amazingly sensitive to temperature changes. In some cases, the human skin can detect changes as small as one one-thousandth of a degree. Only electric thermometers are more delicate. We are about twice as sensitive to heat as to cold.

Another discovery about skin enabled Dr. Hardy to devise a curious "mechanical man" for use in the calorimeter tests. This was the fact that, as a heat-radiating medium, skin is as efficient as black paint. The scientist produced a metal tank approximately the shape and size of a human torso. This he painted black. After it was filled with water, he sealed it up with two electric lamps inside to warm the fluid and a small, electrically spun propeller to keep the water in motion. Placed in the calorimeter, the "mechanical man" radiated heat at approximately the same rate, for each square inch of surface area, as a normal human body. It made long-range tests easy, and relieved the scientists of the monotony of long hours in the vault.

By attaching a strip of moist, tan-colored leather to the side of the tank, Dr. Hardy produced an artificial "skin" which has sweating characteristics almost identical with those of human skin.

Other interesting bits of information about the reaction of our bodies to the rise and fall of the thermometer have been announced in recent months, aiding science in its appraisal of nudism. For example, when we are excited or nervous or afraid, experimenters have found, we literally get cold feet. Delicate electric thermometers show that our feet, hands, and noses are colder than the rest of our bodies.

AGAIN, a rise of only three degrees in temperature, at one point in the scale, increases sweating fifty percent. In a room where the temperature drops from seventy-eight degrees to fifty-eight degrees, a nude person loses twice as much heat at the lower figure as at the upper.

Not long ago, a back-to-nature fadist predicted that eventually a man wearing clothes on Fifth Avenue, in New York City, will attract as much attention as a man without clothes would today. The thorough tests of Dr. DuBois and Dr. Hardy, however, indicate that the prediction will never be fulfilled. For physical reasons, if for no others, man seems destined to continue as the animal that wears clothes.

## A YEAR'S FUN



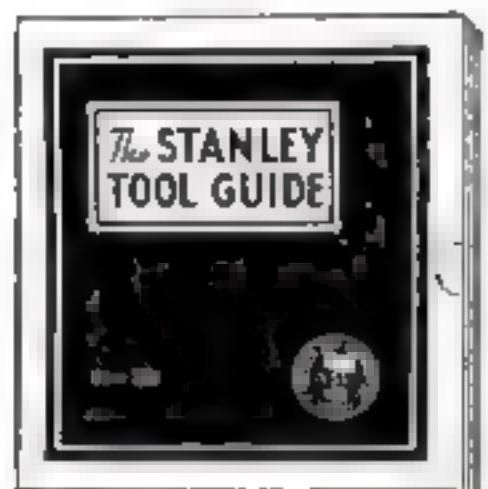
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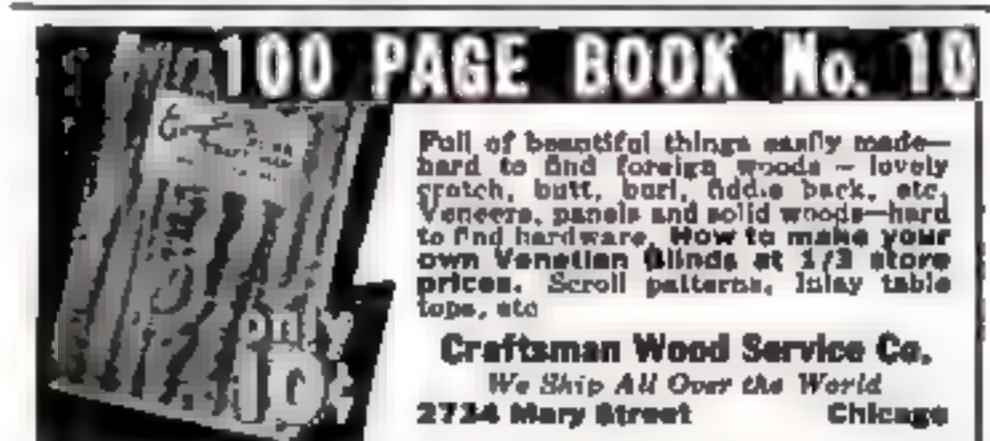
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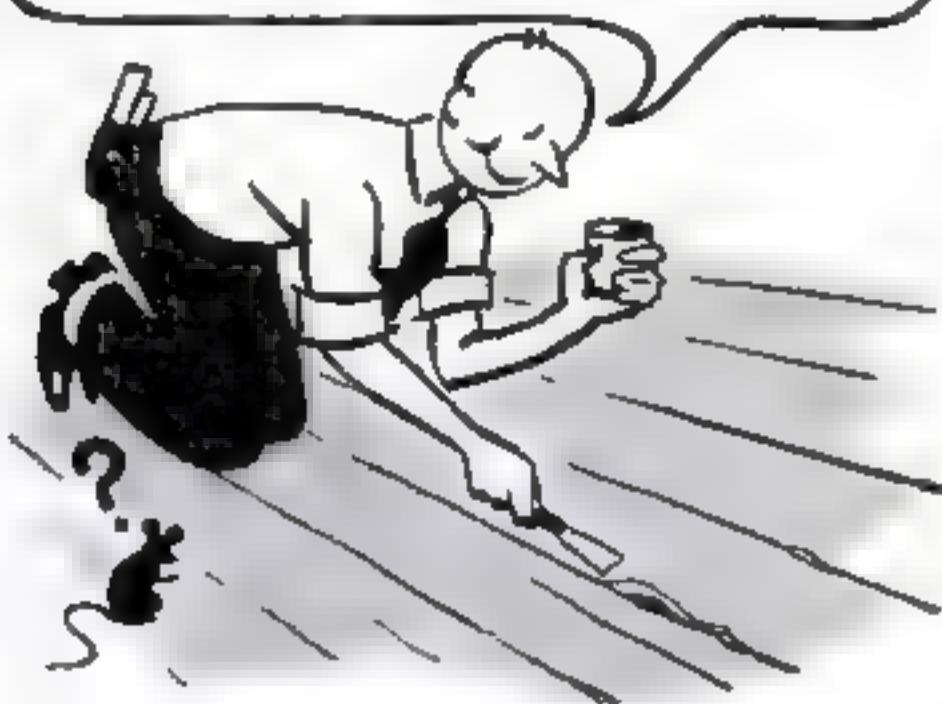
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**Old  
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CEMENT**

## Home Chemist Becomes a Wizard of Glue

(Continued from page 49)

tried out more than 500 formulas. The problem was to produce an adhesive which would hold the metal tightly in place without "breathing" or forming blisters. Previous glues had held metal and wood together, but within a few months blisters, ranging from the size of a pinhead to that of a man's hand, would begin to appear. Albrecht's success came from adding to his mixture a relatively common ingredient which evaporates within a few hours. Without this ingredient, the other chemicals refuse to unite. As the secret material disappears, the final glue defies analysis.

WHEN Albrecht produces a new glue, he puts it through a long series of tests to discover its characteristics. He finds out how it will stand heat, how it resists water, how it reacts to scratching and pressure. To test the metal glue which is being used at the New York World's Fair, he cemented a strip of copper to a cellar door almost three years ago. Beside it, he put the date, June 6, 1935. Every few weeks since, he has tried to pry the metal from the wood with a penknife. It is, however, still holding firmly in place.

Part of the time, Albrecht is working to attain general ends such as glues which will have new and needed properties. The rest of the time, he is seeking to solve specific problems submitted by manufacturers. Here are a few of the requests that have come in during recent months:

A contractor wants a new glue specially designed for sticking glass bricks together in building new-type homes. A maker of engravings for printing asks for a bonding material which will enable him to cement the copper plates directly to wooden blocks without having to use nails. A manufacturer of bathroom fixtures wishes to glue shelf braces and towel racks directly to tiling without using screws. A builder who has been having trouble with putty pulling away from the wood of window frames as the oil dries, wrote to Rowayton to see if the home chemist couldn't provide a glue which he could mix with the putty to eliminate the difficulty.

WHEN I visited him, Albrecht was starting experiments with stainless steel. A large tool concern had asked him to devise a bonding material which would cement thin sheets of the rust-proof material to cores made of cheaper metals. A strange request was made by a garment manufacturer. He wanted a glue that could be rolled out and cut into disks to form buttons!

Several times, Albrecht has been offered financial backing for a large laboratory with elaborate equipment. But he sticks to his cellar workbench where, as the glue industry's free-lance experimenter, he has achieved a place of unique distinction.



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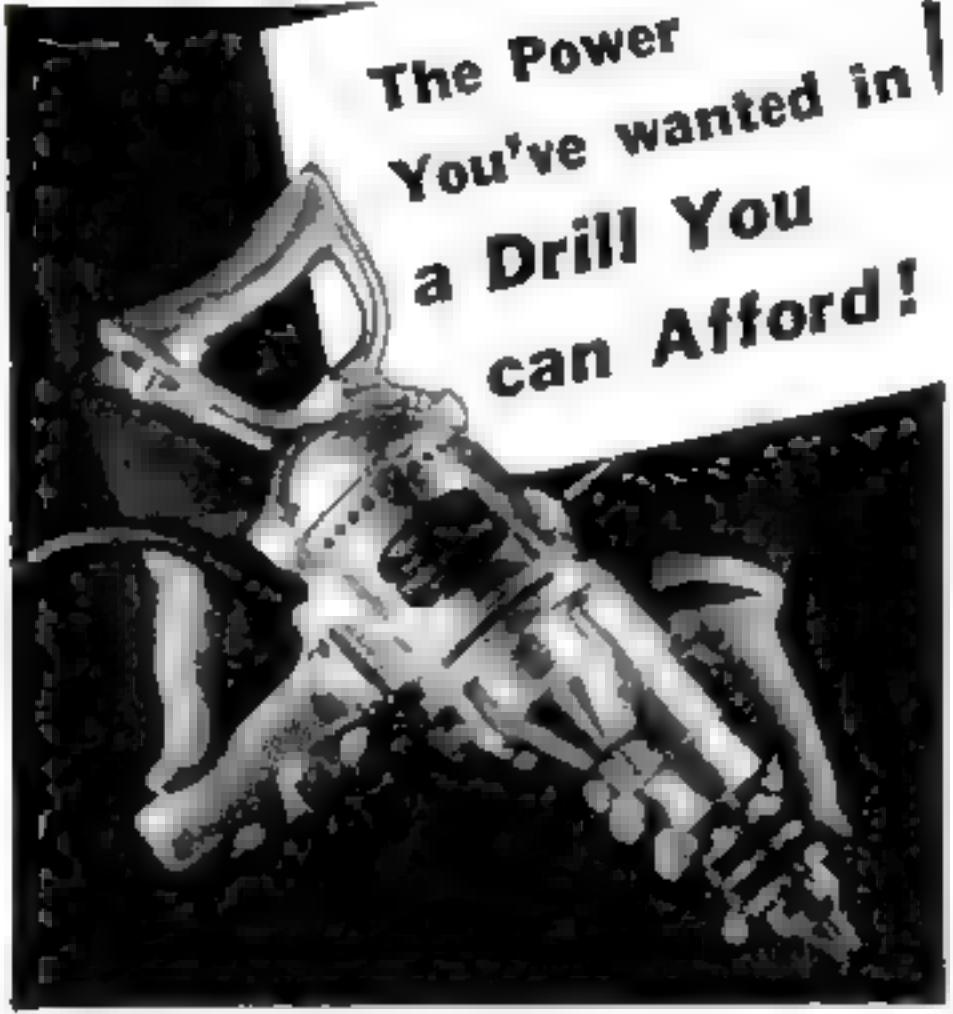
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## Using Skid Chains

(Continued from page 76)

skids if you don't watch yourself."

"Chains do act queer at times," admitted Gus. "The main trouble is, people think that, just because they have chains on, they can turn cowboy and the car won't slide. Naturally, you can't jam on the brakes too suddenly or go around corners too fast. If one wheel happens to lock at a point where there isn't any cross link, the tires are bound to slip. Chains are no free permit for reckless driving in any case, but you're a darned sight safer with them than without them. And there's plenty of going, like the soft snow that you got stuck in, where you just can't navigate without them."

"AND, as far as the racket goes," continued Gus as he strapped his shovel back on the rack on the side of the service car, "you can get rid of most of it by fitting your chains with spring spreaders. They'll cut down the noise and make your chains last longer.

"There's one thing to remember, though. If you do use spreaders, take them off when you get stuck in deep snow. The extra slack in the cross links will let them take a better bite. If chains are too tight and fit the tires too snugly, they won't grip at all."

"What would you have done if you hadn't had any chains to fit my car?" asked Johnson.

"I'd have hooked on the tow car and pulled you out," grinned Gus. "That's the easiest way. I only used the chains to show you they're good things to have along. There are all sorts of tricks you can use to get a car out of deep snow. The main thing is to remember that the rear wheels can turn independently, so there's no sense doing something to one wheel if the other is going to spin."

"A couple of old potato sacks are handy things to carry around with you," Gus went on. "You can stuff them down under the tires when your wheels spin. They're a help even when you're using chains, and when they're not doing active duty they're mighty fine anti-rattlers for packing the tools in your tool compartment."

"BUT no matter what you use," continued Gus, as he stooped down and started unfastening the chains on Johnson's car, "let a little of the air out of your rear tires. If they're a trifle soft, they'll offer more traction surface and won't bounce and spin so much."

"Say, what in blazes are you up to, there?" bellowed Johnson when he realized that Gus was removing the chains.

"Thought I'd better get these mud hooks off your car before they put you into a bad skid," replied the veteran mechanic with a chuckle.

"O. K., Gus. You win. But don't rub it in," grinned the car owner. "Just leave those chains right on there and stick the pair on my bill. I guess the clatter of chains and a few barked knuckles are better than a cracked skull and a ride in an ambulance."

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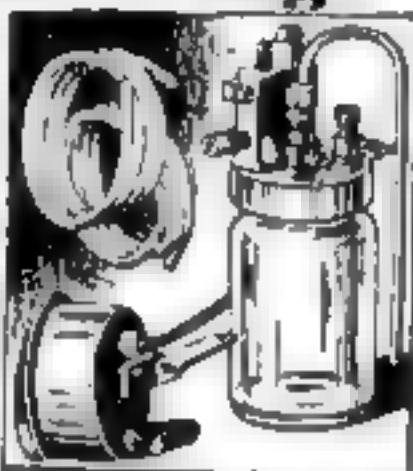
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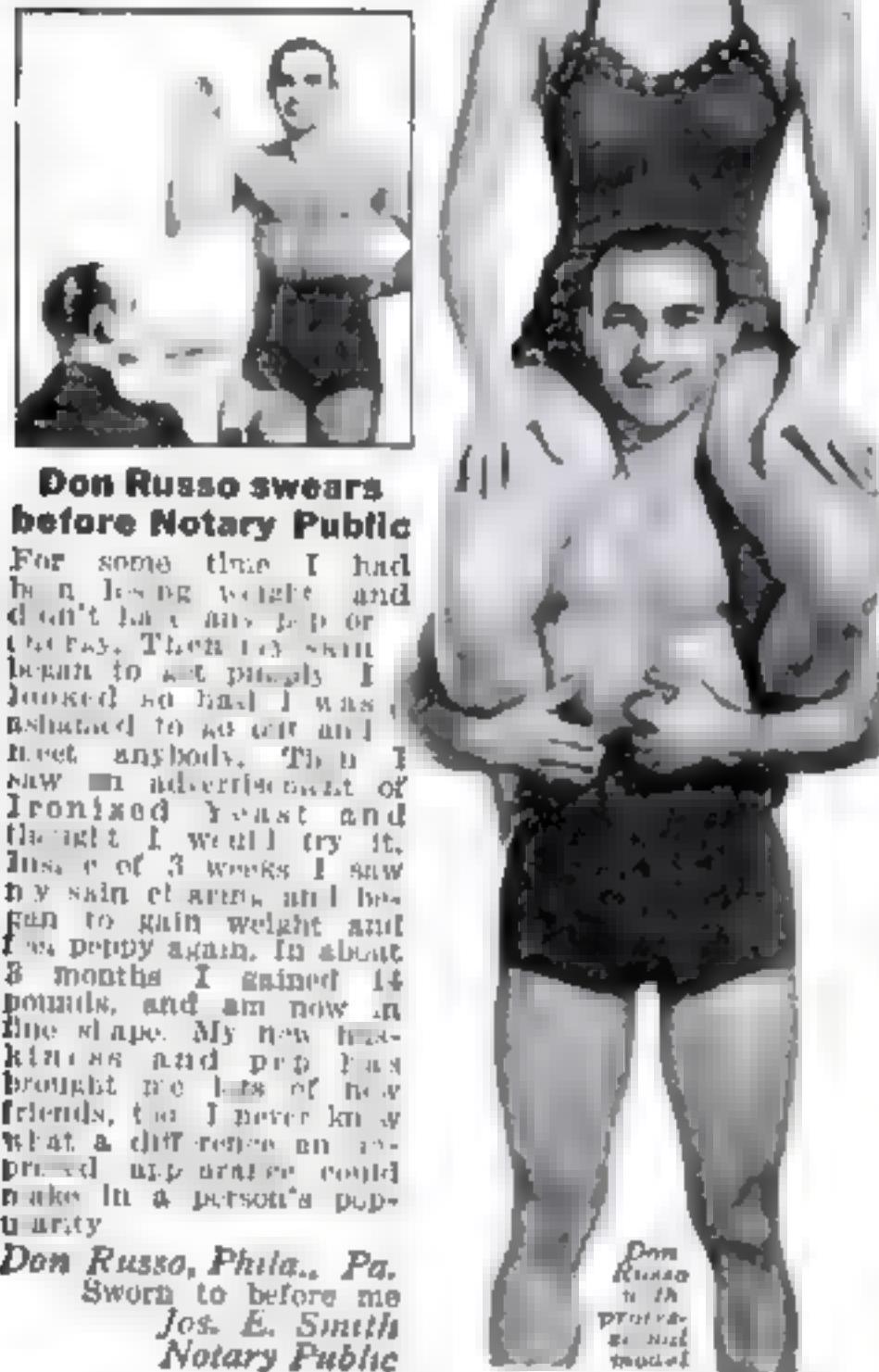
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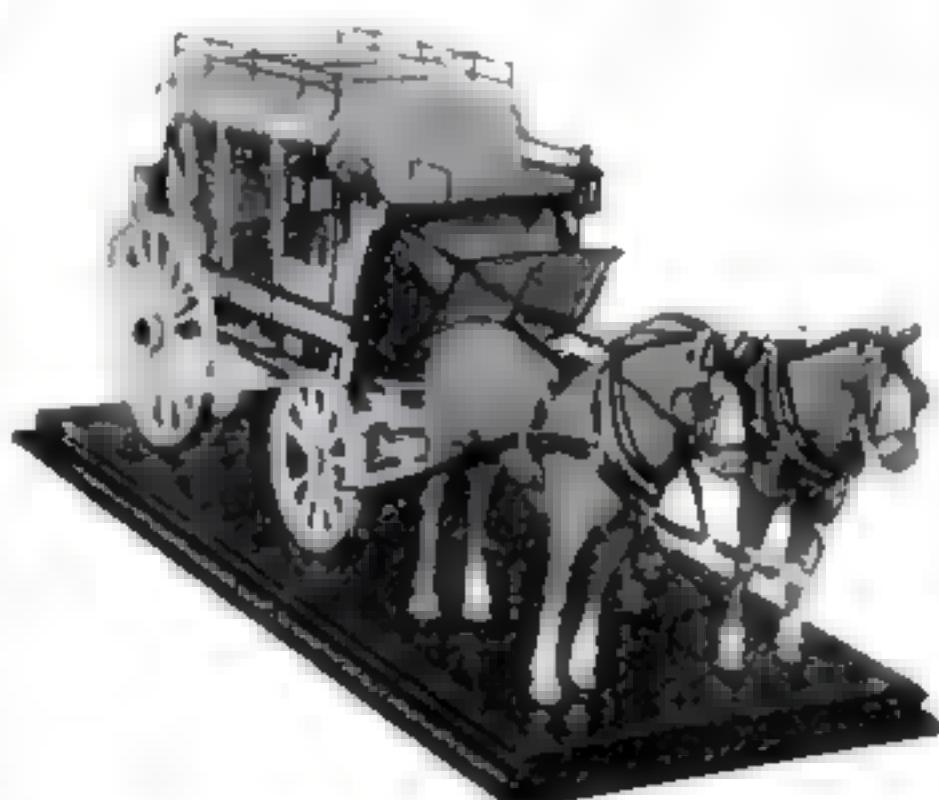
A turned book end with carved decoration

## Turned Wooden Bookends

(Continued from page 89)

cut in the center block as shown in one of the photos and use a wide chisel to remove the ends. Cut off the points as indicated and attach the metal parts.

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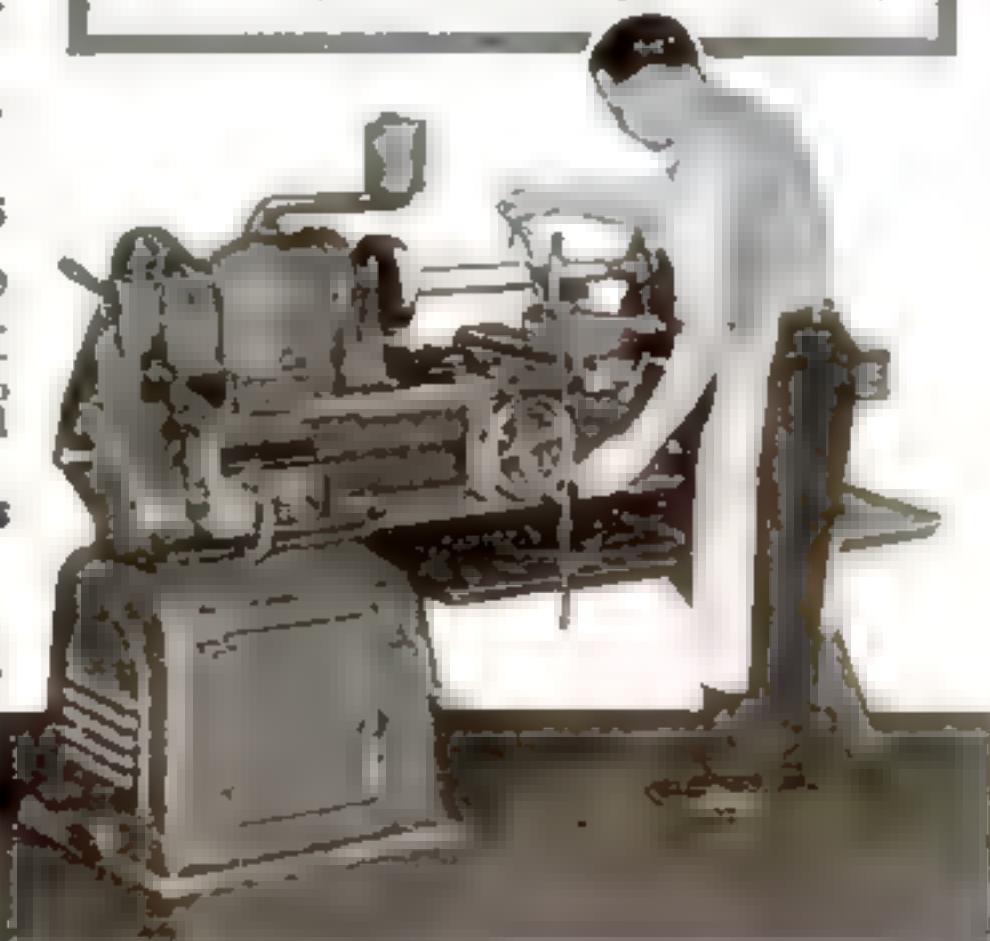
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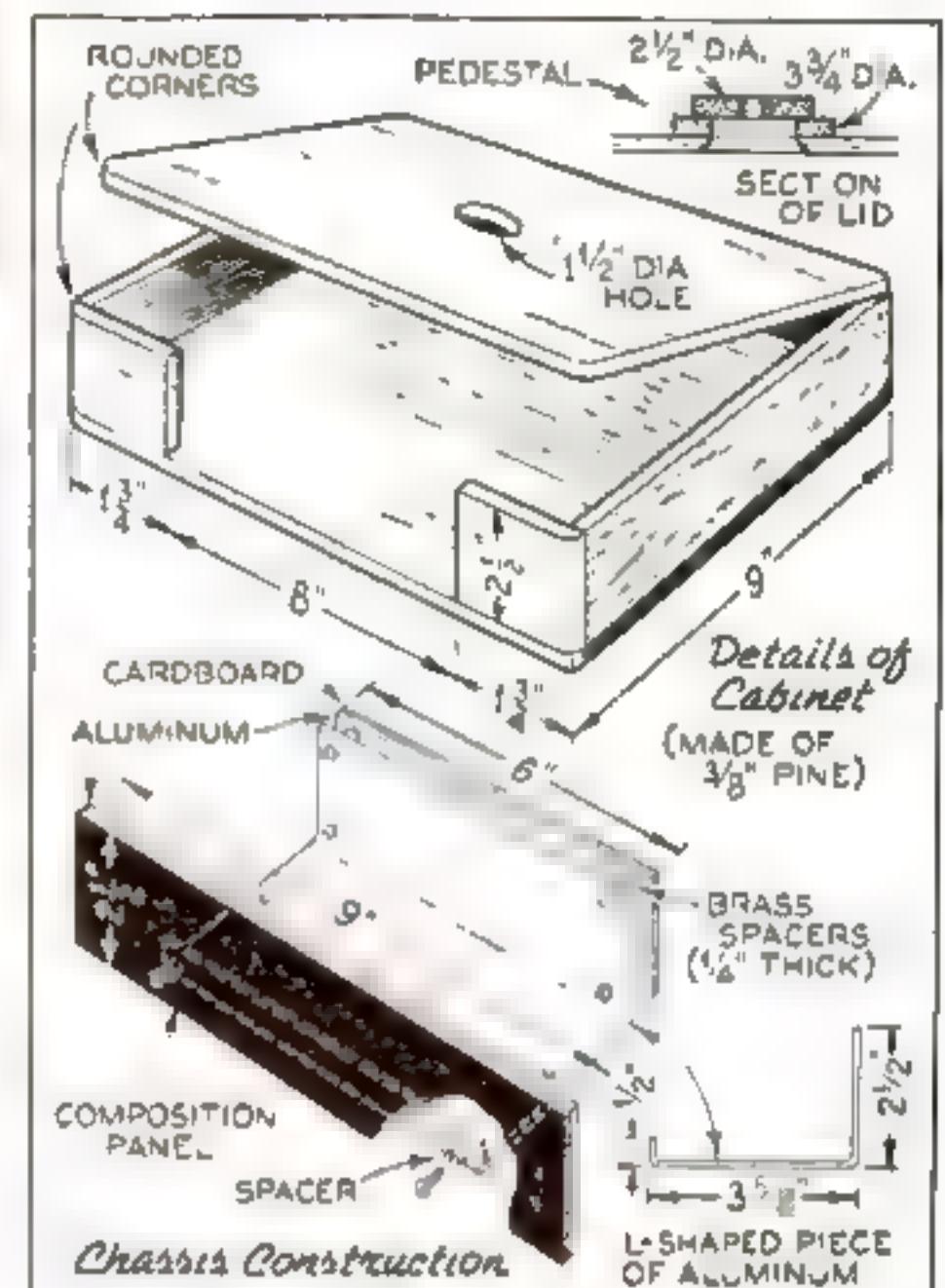
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## Span the World with a Globe Receiver

(Continued from page 108)

operate the set, adjust the filament rheostat to its half-way mark and regulate the regeneration-control condenser until a rushing sound is heard in the earphones. This will mean that the set is oscillating and ready for tuning. For



Plans for the wooden globe pedestal and cabinet, and the cardboard and aluminum chassis

best results, try to keep the regeneration condenser adjusted at a setting just below the point of oscillation.

For the antenna, a fifty-foot wire, rigged outdoors and as far away as possible from buildings and trees, is recommended. Remember, a good outside antenna is an important part of any short-wave receiver.

## POPULAR SCIENCE Question Bee

CORRECT answers to the questions on page 72 are indicated by the letters alongside the numbers below. To find your score, give yourself four points for each one you had right. A total of 80 to 92 is good, and from 92 to 100 is excellent.

### QUESTIONS

- |      |       |       |       |       |
|------|-------|-------|-------|-------|
| 1. d | 6. c  | 11. c | 16. a | 21. b |
| 2. e | 7. c  | 12. b | 17. b | 22. a |
| 3. b | 8. a  | 13. c | 18. c | 23. c |
| 4. c | 9. d  | 14. d | 19. d | 24. a |
| 5. e | 10. b | 15. c | 20. a | 25. b |

### PICTURES

- |                      |                     |
|----------------------|---------------------|
| 1. ellipse           | 5. parallelogram    |
| 2. segment of circle | 6. parabola         |
| 3. prism             | 7. sector of circle |
| 4. catenary          | 8. spiral           |
| 9. helix             |                     |

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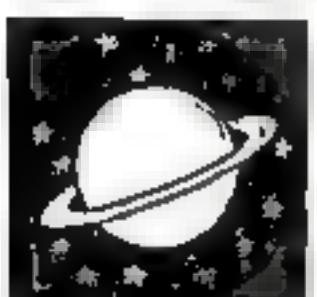
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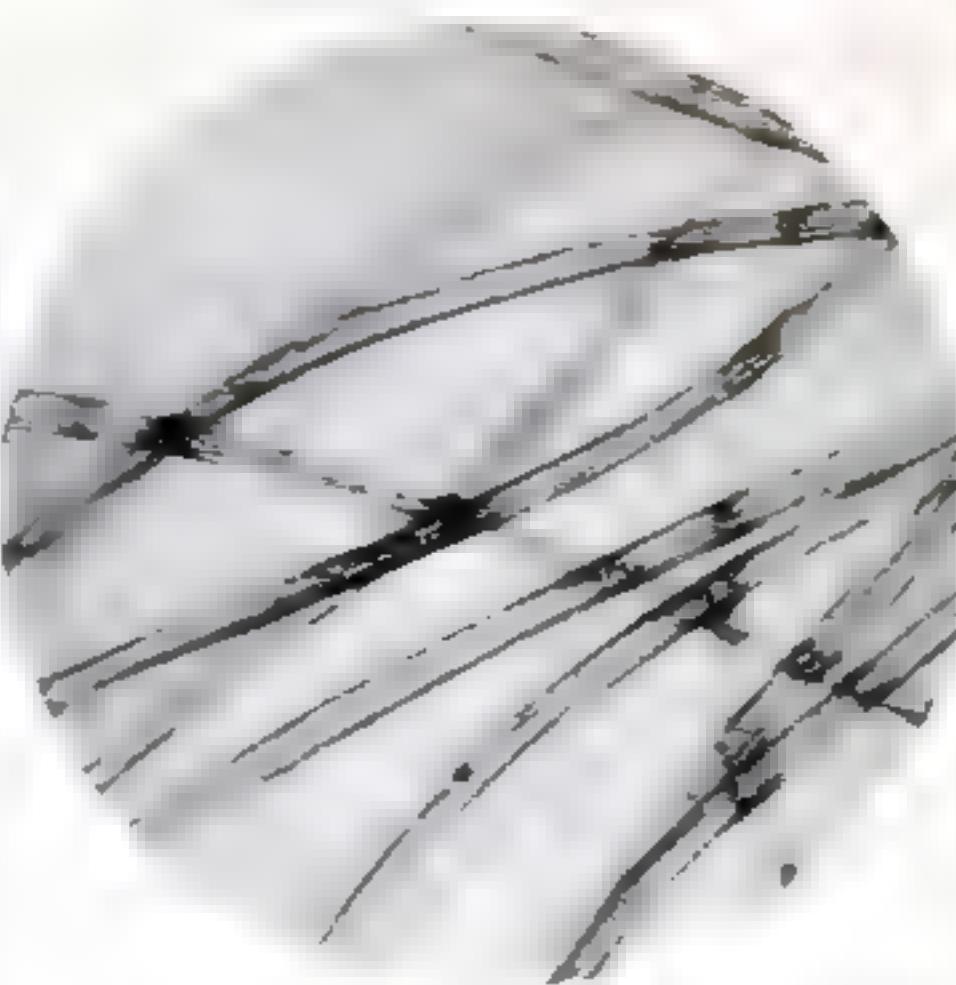
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**WOLLENSAK**



Rayon fibers, showing longitudinal striations

## Identifying Fabrics With Your Microscope

(Continued from page 103)

transparent, and details of fiber structure are easier to see.

Next, try xylol instead of water. Xylol is a common clearing agent. It also is a solvent for Canada balsam, which you use in making permanent slides of cloth samples.

To make such a permanent slide, simply place the sample on the slide, loosen a few threads and fibers, and drop a little xylol on it. Hold the cover glass horizontal, and put just enough balsam on it to immerse the specimen completely. Lower the cover glass, balsam side down, on the specimen, and press it gently to spread the balsam. This treatment increases transparency of the fibers greatly—sometimes too much.

**A**N IMPROVED method of mounting that reveals surface details as well as internal ones better, was worked out recently in Germany. It employs a material called niglytin, a mounting medium containing a black pigment. Best results are obtained with only a few fibers of fairly uniform diameter, arranged so that they do not cross. The cover glass is pressed down until the fibers touch both it and the slide. The niglytin holds back much of the light that otherwise would pass around the fibers, but lets light pass through them. The effect is much like that obtained with dark-field illumination.

If you want to stain textile fibers, try some of the textile dyes obtainable at drug stores. Standard microscopic stains that will work with animal and vegetable materials can be used equally well. Usually, staining is not necessary.

Examination of such cross sections is important, in the accurate grading of wool. Wool from one sheep may contain fibers of uniform size, while that from another contains various sizes. Some strands may be oval, while others round. All these things affect wool quality.

Wool and hair fibers are essentially the same. The term wool usually is applied to the fleece of sheep, while hair

(Continued on page 132)

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A-2

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skinny since  
childhood. Last  
September was  
my 19th birth-  
day, so you see  
how long I had  
been skinny.

Most every  
Sunday the kids  
in the neighbor-  
hood would go  
swimming. I did  
not go with them. I suppose  
they knew why. I was ashamed  
of my skinny body. I was nervous  
too. Even when I went to  
town or to picnics in summer,  
I was ashamed to have my  
sleeves rolled up like the other  
fellows did. A few months  
ago when I was up town I  
stepped on a pair of scales.  
I weighed about 120 lbs. and me a young man go-  
ing on twenty. I thought of the future—would I  
always be skinny? I had seen Kelpamalt advertised  
in the papers and magazines so I bought a bottle. I  
was sure amused at how much I gained and how much  
better I felt. I bought four more bottles. Over two  
months have passed. I have gained better than 80  
pounds. You don't know how much better I feel and  
look and how thankful I am for what Kelpamalt has  
done for me. I would not take a hundred dollars for  
what Kelpamalt has done for me, if I could not get  
any more.

So I am going to thank Kelpamalt and the Kelpa-  
malt Company for what their sea minerals have done  
for me.

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and strength builder because it helps supply the iron,  
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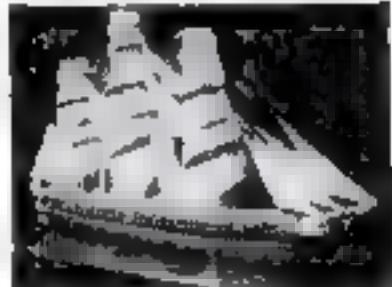
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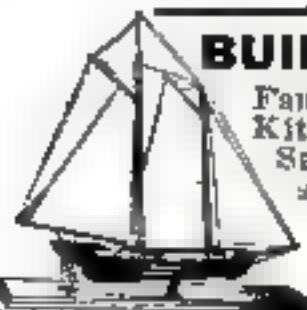


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## Identifying Fabrics With Your Microscope

(Continued from page 132)

does not dye well, the canals may be closed as a result of contact with lime, or some other cause.

Cotton is the hair from around the seed of a cotton plant. While such a hair is growing, sap is circulating through it. When it is ripe, the sap flow ceases, and the hair walls collapse, perhaps from vacuum action. This converts the hair into a flat ribbon, which shrinks and twists as it dries. Thus, under the microscope, a cotton fiber resembles a ribbonlike shaving that is very much twisted. The medullary canal is usually visible.

LITTLE or no twist may mean several things. The fibers may have been dead or unripe when picked, or they may be mercerized. In the process of mercerizing cotton, the cuticle or outer layer is dissolved away with strong alkali. The cell walls swell and expand. Because the cloth is under tension during the process, much of the natural twist of the fibers disappears. Mercerized-cotton fibers appear, through the microscope, as smooth cylinders with considerable luster.

Linen is the strong bast, or woody, fiber obtained from a flax stalk after the bark has been removed. Under the microscope, the cylindrical fibers look very much like tiny stems of glassy bamboo. They are marked at intervals by fine cross lines and sometimes by small notches.

Silk can be distinguished from all other textile fibers of natural origin by the absence of cellular structure. A strand of natural silk consists of two threads cemented together. The silk-worm produces the strands by ejecting a transparent fluid from two gland openings beneath its lip. As the two strands are formed, they are cemented together to form one. Silk fresh from the cocoon is covered with silk gum, which is removed by boiling. This leaves the characteristic silk strand visible under the microscope, an almost endless cylinder, transparent and lustrous.

**R**AYON, an artificial silk, is made by squirting cellulose preparations through small orifices and hardening the resulting strands by chemical action as they are formed. These strands look like tiny glass rods or ribbons, and frequently have lengthwise striations, or parallel grooves. They are distinguished from genuine silk by the absence of a dividing line and silk's high luster, and by the presence of occasional specks, granules, and air bubbles.

As an amateur microscopist, you have a special reason for learning to know cotton and wool fibers when you see them. Stray ones from your clothing have a habit of turning up under cover glasses, no matter what you are trying to examine. If you know these fibers, you won't mistake them for something else.

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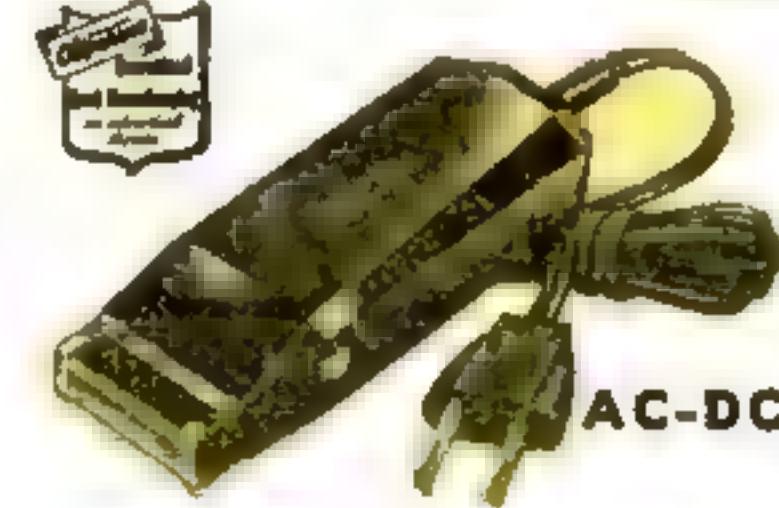


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## Crime-Detection Tests for the Home Chemist

(Continued from page 134)

grains (about 1.6 grams) of silver nitrate crystals, and thirty drops of strong nitric acid. A drop of this reagent leaves no stain on a genuine silver coin, but discolors a counterfeit at the spot where the reagent is applied.

To curb the activities of petty thieves, a simple chemical trick has been found effective. Handles of desk drawers and cupboards subject to pilfering are dusted on the under side, where it will not show, with a brilliant-colored, powdered dye such as malachite green, gentian violet, or magenta fuchsin. A person who does not know where they have been applied is sure to come away with fingers stained by the telltale dye. Thus the real culprit is quickly identified, and innocent persons are cleared of suspicion.

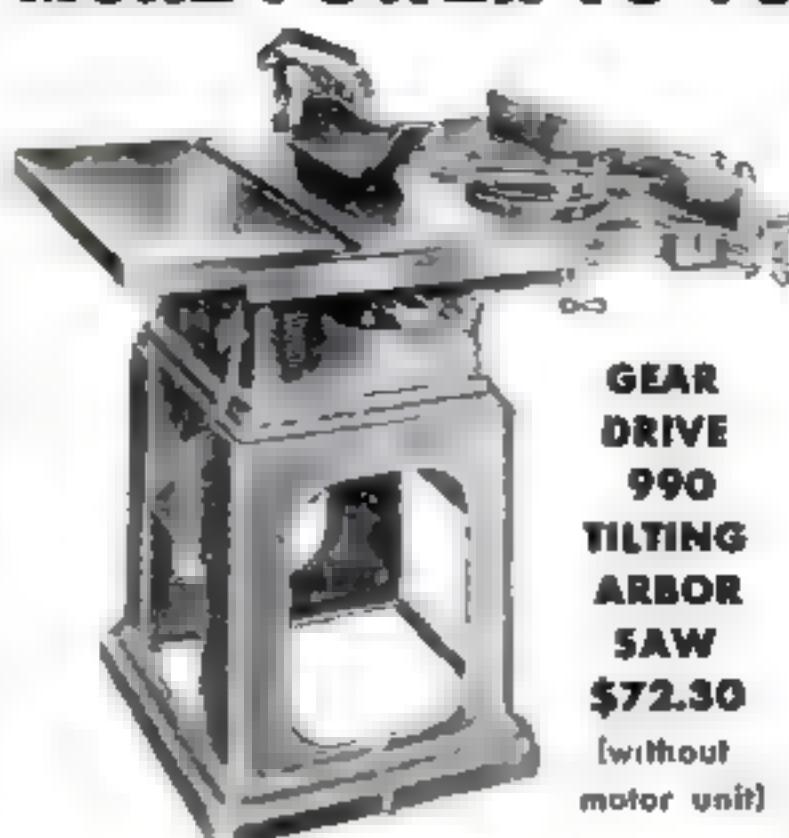
**D**YES of the kind just described are widely used in microscopy, and are obtainable from many dealers in chemical and biological supplies. They are solid chemicals—not liquid—and may be applied to any surface such as a drawer pull with a wad of absorbent cotton, attached for convenience to a tube thrust through the cork of the bottle containing the dye. The stain left upon the skin by such a dye is almost impossible to remove at once, even by the most strenuous scrubbing, as any professional worker with these materials—and his family—will be ready to testify. It behooves the user of this scheme, like anyone else who sets a trap, to beware of being caught in his own snare.

Few amateur chemists are likely to become toxicologists who must test the vital organs of murder victims or suicides for traces of arsenic poisoning, but a tiny particle of some arsenic chemical, or a garden spray known to contain arsenic, will serve to demonstrate the principle of the method. You can also detect any of the poison that may have been left upon an apple in spraying, by washing the apple with a fluid ounce of a solution of soap and sodium chloride, and using this solution for your test.

**T**O A flask with a one-hole stopper, attach a vertical glass tube about half an inch in diameter, or a chemical drying tube like the one suggested for the iodine-vapor pistol. Place a wad of absorbent cotton, not packed very tightly, in the bottom of the tube. Then stuff a few sheets of filter paper into the tube and wet them with a solution of lead acetate, made by dissolving about one gram of lead acetate in twenty cubic centimeters of water. Use just enough of the solution to dampen the paper thoroughly. The top inch of the tube should contain a little funnel-shaped or cup-shaped piece of filter paper soaked with a strong solution of silver nitrate, or containing a crystal

(Continued on page 136)

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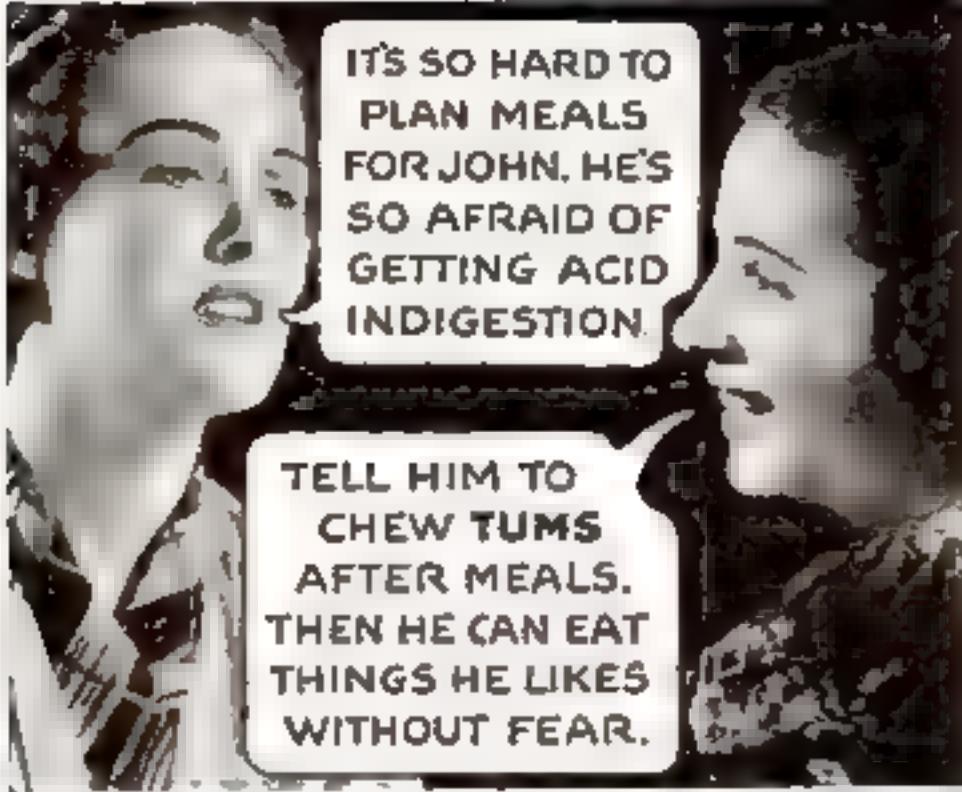
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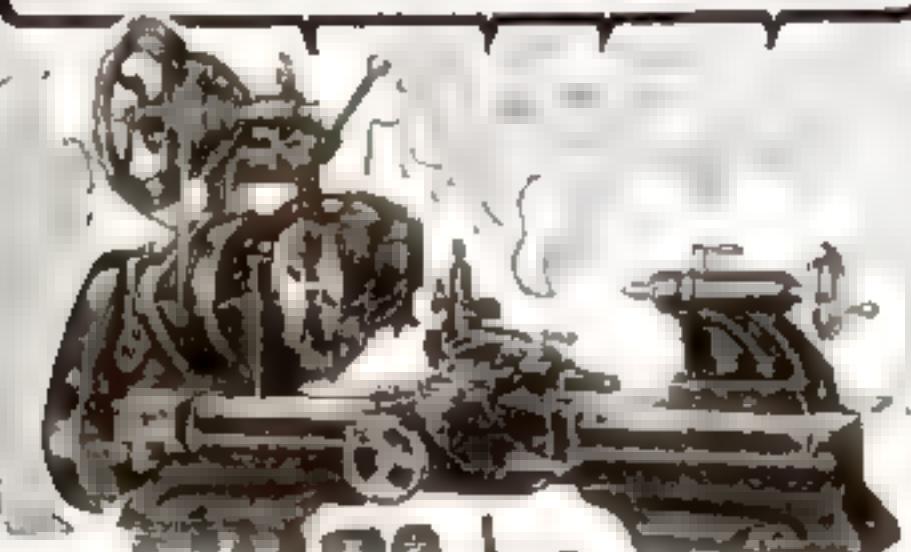


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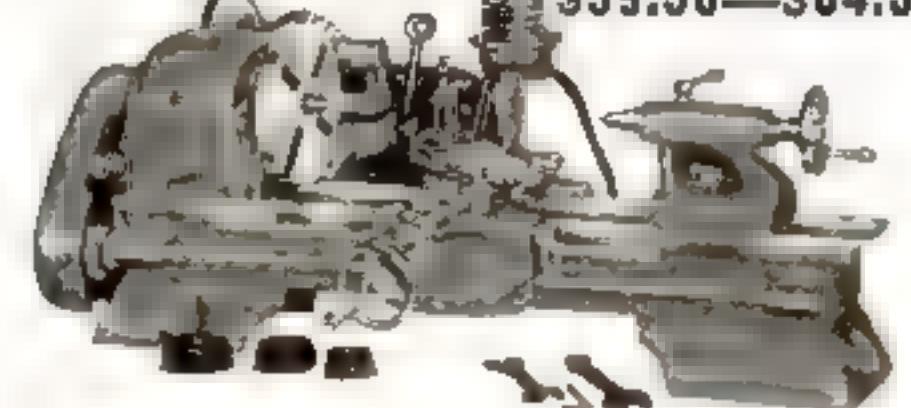


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## Crime-Detection Tests for the Home Chemist

(Continued from page 135)

of silver nitrate over which several drops of water are poured.

In the flask itself, place some dilute sulphuric acid and pure zinc metal. Heat the flask with an alcohol lamp or the low flame of a Bunsen burner, to start the formation of hydrogen gas by the action of the acid on the metal. If your zinc is too pure, the acid may not attack it; in this case, add a drop of copper sulphate solution to the acid in the flask. Once the evolution of hydrogen gas has well begun, remove the flame, which no longer is needed, and let the chemical action proceed of its own accord for several minutes.

**F**OR THE paper cup that you have wet with silver nitrate shows no discoloration at the end of these preliminaries, add the substance to be tested for arsenic to the flask—a known arsenic chemical, the wash from an apple, or a sample of garden spray. Any arsenic that the test specimen may contain will combine with the hydrogen gas that you are generating, and arsine gas, a compound of arsenic and hydrogen, will be formed. It passes up through the lead-acetate paper, which removes any hydrogen sulphide gas that might also be produced in the reaction and interfere with the arsenic test. Finally the arsine gas comes in contact with the silver-nitrate test paper, with which it will react. If the paper becomes yellow, brown, or black, therefore, the substance you have added to the flask contains arsenic, the depth of the shade of the test paper depending upon the amount of arsenic present.

In case you should find the paper cup already discolored before you add the test sample to the flask, then arsenic is present as an impurity in the zinc, the acid, or both, and you will have to obtain purer, arsenic-free chemicals to test for arsenic in anything else.

**M**ERCURIC chloride can be used upon the test paper in this experiment, instead of silver nitrate. In this event, the best plan is to impregnate the paper beforehand with a solution of mercuric chloride, and dry it before you place it in the tube. Like the silver-nitrate paper, it will be discolored either by arsenic in the test specimen or by arsenical impurities in the chemicals used, and again the preliminary "blank experiment" without the material to be tested serves as a check to show where the arsenic really is.

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## Man Fights the Rat

(Continued from page 53)

terrifying rat menace? A New York expert in rat control explains that practically every warehouse, factory, office building, apartment house, power plant, and railroad station employs exterminators to keep the premises rat-free.

Commonly used poisons include phosphorus, arsenic, squill, and a thallium preparation, although many experts refuse to use the latter, since there is said to be no known antidote in case a human being should swallow some by accident. Luscious tidbits of poisoned bait are placed near rat holes and runways, always hidden within paper bags. Curiously enough, rats prefer to hunt food that is hidden rather than to eat what is left in the open.

**SQUILL**, made by powdering a European plant bulb, is used in many cases where domestic animals might get at the poisoned bait. This substance can be employed safely, because a rat has a "one-way" throat and is unable to disgorge anything it swallows. In quantity, squill is an emetic, and if eaten by a dog or cat will be quickly thrown up. Rats, however, cannot rid themselves of it, and so they die.

Cyanide gas is employed wherever it is possible to seal an infested area completely. This method is used on ships, which are required by law to be fumigated at least twice a year.

Rat boards are an excellent substitute where, for one reason or another, poison is not advisable. These are merely stout boards fastened down over rat runways and near rat holes. Their surfaces are covered with a layer of soft but very adhesive glue that catches the rodents just as fly paper holds insects.

Trapping is the least satisfactory of all rat-catching methods, experts declare, for when one rat is caught his comrades are canny enough to avoid the snare. Many rats are quick enough to snatch the bait off a spring trap without being caught in the jaws. According to Dr. C. K. Stewart, director of rodent control for the Los Angeles, Calif., health department, rats have been known to jump back and forth over traps until their tails released the springs, and then chew up the bait at their leisure. If its tail gets caught, the rat will gnaw it off and escape.

ONE of the most recent developments in the war on rodents is reported from Europe. Health officials there are disposing of rats by spreading among them the virus of a disease that is said to kill the animals by the thousands. It is believed that the disease employed is confined solely to rodents, but because there is a remote chance that it might spread to other forms of animal life and even to human beings, the U. S. Public Health Service has so far forbidden its use in this country.

Sometimes a new system for killing rats is stumbled on by accident. In a large bottling factory, for example,

(Continued on page 138)

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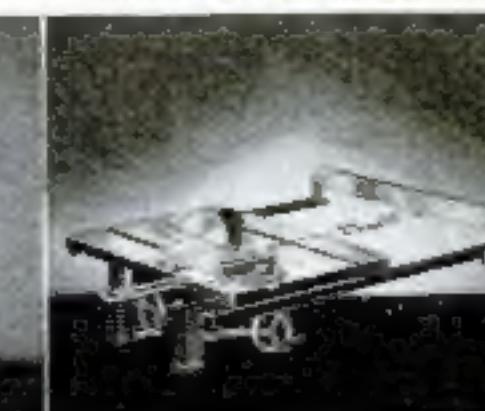
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**HOW TO TAKE CARE OF YOUR PIPE**

## Man Fights the Rat

(Continued from page 137)

a workman left a bag of grain behind a vat of water, the surface of which was covered with soaking corks, several layers deep. One morning, the worker was amazed to find the vat full of drowned rats, which evidently had tried to use the buoyant corks as a surface over which to reach the grain. The corks held the tentative weight of one foot, but when a rat placed his entire weight on them, he was unceremoniously dumped to his death in the vat.

Such mistakes are rare among rats, however, for the rodents show amazing ingenuity in accomplishing their ends. A story is told of a band of rats that attacked a piece of meat hanging on a hook in a butcher shop. Unable to reach it by ordinary means, they formed a rough pyramid by piling onto one another until the topmost rat could reach the meat and gnaw it loose.

MANY other stories of rat "intelligence" are told, but experts generally feel that the incidents are greatly exaggerated. One such case is the story of a group of rats which formed a chain by grabbing one another by the tail to lower one of the band into a hole for food that could not be reached otherwise. But experts actually have seen a pair of rats stealing eggs by an odd method. One would wrap its tail around an egg and drag it off, while the other balanced the prize to prevent breakage.

It seems a far cry from stealing eggs to spreading pestilence and death. But scientists know that the rat, the scavenger of the garbage can and the pesthole, carries disease germs, pollutes water, and contaminates food. It spreads typhus fever, infectious jaundice, and the dreaded bubonic plague—the terrible "black death" that once ravaged Europe.

The Oriental rat flea that carries plague germs reached the Pacific coast of the United States about 1900. Since then, the few minor epidemics that have occurred have been quickly recognized and checked, thanks to the vigilance of medical science. Today, health departments all over the country regularly receive rat carcasses for examination.

BUT the battle is not confined solely to cities and seaports, for in small towns and on farms the rat hordes are even larger than in densely populated areas. Farmers know the rat as one of their greatest enemies, a carrier of disease to farm animals, a destroyer of grain, a marauder to be feared and fought. Authorities say that ravenous rats have attacked full-grown hogs, gnawing holes in the animals' bellies.

Thus in city, town, and farm, the war on rodents goes on. The conflict may prove endless, for rats multiply at an amazing rate. Under ideal conditions, the progeny of a single pair would theoretically reach the staggering total of 350,000,000 in three years. Year by year, however, official figures point to slow but steady progress as science gains ground in the crusade against rats.

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## Luckies—A Light Smoke

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